BEETLES

associated with stored products in Canada

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associated with stored products in Canada:

An identification guide

Yves Bousquet
Biosystematics Research Centre
Ottawa, Ontario

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SUMMARY

Every year arthropods destroy or contaminate large quantities of stored products in Canada. Beetles are unquestionably the most important group of organisms attacking these products. This publication is intended to provide extension entomologists, inspectors, and naturalists with an identification guide of the most common beetles associated with stored products in Canada. In addition to keys and plates, the following sections are included for each species treated: diagnosis, sexual dimorphism, distribution, and economic importance.

RÉSUMÉ

Chaque année, de grandes quantités de produits entreposés au Canada sont détruits ou contaminés par la présence d'arthropodes et les Coléoptères forment sans contredit le plus important groupe d'organismes vivants qui s'attaque à ces produits. Le but de l'ouvrage est de fournir aux conseillers techniques en entomologie, aux inspecteurs et aux naturalistes un guide de détermination des principaux Coléoptères associés aux produits entreposés au Canada. En plus des tableaux d'identification et des illustrations, l'ouvrage comprend, pour chaque espèce traitée, une diagnose ainsi que des sections sur le dimorphisme sexuel, la distribution et l'importance économique.

INTRODUCTION

This book is intended to provide extension entomologists and naturalists with an identification guide to the common beetles associated with stored products in Canada. Only the adult stage is dealt with in this book. The distribution and economic importance of each species are discussed; information on the biology is omitted, because it is the subject of a recent publication (Campbell et al. 1989).

Beetles represent the largest natural order in the animal kingdom; more than 9000 species are estimated to occur in Canada (Campbell 1979). The main characteristic of the adult beetle is the modification of the anterior wings, the elytra, into a stiff cover that protects the membranous posterior wings (if present) and the abdomen when the beetle is at rest. In a few species, such as the female of *Thylodrias contractus*, the elytra have been secondarily lost. Like many other insects, beetles have a complete metamorphosis, with four distinct stages in their life cycle: egg, larva, pupa, and adult. More information about the general morphology and biology of Coleoptera can be found in Crowson (1981) and Halstead (1986).

Every year, large quantities of stored products are destroyed or contaminated because of the presence of arthropods, and beetles are by far the most important group of animals attacking these products (Hinton 1945). Over 600 species around the world have been found associated with stored products, and 120 of these are dealt with here (see "List of beetles associated with stored products in Canada"). The species include those established or found more or less regularly in Canada and associated with stored products. Less than half of these species actually eat the product or one of its constituents. In fact, many of the stored-product species feed on fungi or on dead arthropods and small mammals present in places where food is stored. Species known in Canada only from interceptions at ports of entry have not been included, except for *Trogoderma granarium*. Also excluded are the species that are general predators, such as Carabidae and Staphylinidae, and those attacking structural woodwork in buildings, such as many Anobiidae, Bostrichidae, and Cerambycidae. Although some of these species may be found in buildings where food is stored, they are only incidental and thus are not considered to be associated with stored products.

This guide is organized in two parts. The first includes keys and illustrations of the common stored-product species in Canada. The second part presents, for each species treated, sections on diagnosis and sexual dimorphism as well as information on distribution and economic importance.

List of beetles associated with stored products in Canada

Anobiidae
Lasioderma serricorne (Fabricius)
Stegobium paniceum (Linnaeus)

Anthicidae
Anthicus cervinus LaFerté-Sénectère
Anthicus ephippium LaFerté-Sénectère
Anthicus flavicans LeConte
Anthicus floralis (Linnaeus)
Anthicus formicarius (Goeze)
Anthicus hastatus Casey
Anthicus punctulatus LeConte
Anthicus scabriceps LeConte

Anthribidae
Araecerus fasciculatus (De Geer)

Bostrichidae
Dinoderus minutus (Fabricius)
Rhyzopertha dominica (Fabricius)

Bruchidae
Acanthoscelides obtectus (Say)
Bruchus pisorum (Linnaeus)

Cerylonidae
Murmidius ovalis (Beck)

Cleridae
Necrobia rufipes (De Geer)
Necrobia violacea (Linnaeus)

Cryptophagidae
Atomaria sp.
Cryptophagus acutangulus Gyllenhal
Cryptophagus cellaris (Scopoli)
Cryptophagus laticollis Lucas
Cryptophagus obsoletus Reitter
Cryptophagus pilosus Gyllenhal
Cryptophagus saginatus Sturm
Cryptophagus scanicus (Linnaeus)
Cryptophagus scutellatus Newman
Cryptophagus setulosus Sturm

Cryptophagus stromus Woodroffe & Coombs
Cryptophagus subfumatus Kraatz
Cryptophagus varus Woodroffe & Coombs
Henoticus californicus (Mannerheim)
Henoticus serratus (Gyllenhal)

Cucujidae
Ahasverus advena (Waltl)
Cryptolestes ferrugineus (Stephens)
Cryptolestes pusillus (Schönherr)
Cryptolestes turcicus (Grouvelle)
Oryzaephilus mercator (Fauvel)
Oryzaephilus surinamensis (Linnaeus)

Curculionidae
Sitophilus granarius (Linnaeus)
Sitophilus oryzae (Linnaeus)

Dermestidae
Anthrenus fuscus Olivier
Anthrenus museorum (Linnaeus)
Anthrenus scrophulariae (Linnaeus)
Anthrenus verbasci (Linnaeus)
Attagenus unicolor (Brahm)
Dermestes ater De Geer
Dermestes frischii Kugelann
Dermestes lardarius Linnaeus
Dermestes maculatus De Geer
Dermestes marmoratus Say
Dermestes signatus LeConte
Megatoma variegata (Horn)
Reesa vespulae (Milliron)
Thylodrias contractus Motschulsky
Trogoderma glabrum (Herbst)
Trogoderma granarium Everts
Trogoderma inclusum LeConte
Trogoderma sinistrum Fall
Trogoderma sternale Jayne
Trogoderma variabile Ballion

Endomychidae
Mycetaea subterranea (Fabricius)

Histeridae
Carcinops pumilio (Erichson)
Gnathoncus nanus (Scriba)

Lathridiidae
Aridius nodifer (Westwood)

Cartodere constricta (Gyllenhal)
Corticaria sp.
Corticarina sp.
Dienerella arga (Reitter)
Dienerella costulata (Reitter)
Dienerella filiformis (Gyllenhal)
Dienerella filum (Aubé)
Dienerella ruficollis (Marsham)
Enicmus fictus Fall
Enicmus mimus Fall
Lathridius minutus (Linnaeus)
Melanophthalma sp.
Thes bergrothi (Reitter)

Mycetophagidae
Litargus balteatus LeConte
Mycetophagus quadriguttatus Müller
Typhaea stercorea (Linnaeus)

Nitidulidae
Carpophilus brachypterus (Say)
Carpophilus hemipterus (Linnaeus)
Glischrochilus fasciatus (Olivier)
Glischrochilus quadrisignatus (Say)
Nitidula bipunctata (Linnaeus)
Nitidula ziczac Say
Omosita colon (Linnaeus)
Omosita discoidea (Fabricius)

Ptinidae
Gibbium aequinoctiale Boieldieu
Mezium affine Boieldieu
Niptus hololeucus (Faldermann)
Pseudeurostus hilleri (Reitter)
Ptinus bicinctus Sturm
Ptinus clavipes Panzer
Ptinus fur (Linnaeus)
Ptinus ocellus Brown
Ptinus raptor Sturm
Ptinus villiger (Reitter)
Sphaericus gibboides (Boieldieu)
Tipnus unicolor (Piller & Mitterpacher)
Trigonogenius globulus Solier

Rhizophagidae
Monotoma longicollis Gyllenhal
Monotoma picipes Herbst

Tenebrionidae
Alphitobius diaperinus (Panzer)
Alphitobius laevigatus (Fabricius)
Alphitophagus bifasciatus (Say)
Blapstinus substriatus Champion
Cynaeus angustus (LeConte)
Gnatocerus cornutus (Fabricius)
Palorus ratzeburgii (Wissmann)
Palorus subdepressus (Wollaston)
Tenebrio molitor Linnaeus
Tenebrio obscurus Fabricius
Tribolium audax Halstead
Tribolium castaneum (Herbst)
Tribolium confusum Jacquelin du Val
Tribolium destructor Uyttenboogaart
Tribolium madens (Charpentier)

Trogositidae
Tenebroides mauritanicus (Linnaeus)

IDENTIFICATION

This section includes keys and illustrations for the identification of beetles commonly associated with stored products in Canada. The keys are artificial and are based largely on simple characters, such as coloration, shape of pronotum and antenna, density of punctation, and size. If more than one character is used in a couplet, the easiest observable or the least variable is listed first. Most of these characters are illustrated by line drawings. Because many species discussed here are small (less than 3 mm), proper identification usually requires the use of a binocular microscope, with a magnification of at least 40×, and a good light source.

Most stored-product pests are not related, and thus the adults of many species can be easily identified by comparing them with the habitus drawings. Following the keys, a number of illustrations (Figs. 169–175) are provided for most species discussed in this book. The species are grouped according to their general habitus. If two or more species have the same general habitus (usually belonging to the same genus), the reader is referred to the appropriate key and couplet for specific identification.

It is important to keep in mind that the following keys are written for species found in a particular habitat. Occasionally, strays could be encountered in storage places. In such cases, the reader should consult more comprehensive books, such as Borror et al. (1981) or Arnett (1973), for an identification at the family level and at generic levels.

IDENTIFICATION KEYS

Key A GENERAL

1(0) Head prolonged into snout (Fig. 1) ..... (CURCULIONIDAE) ... 2

– Head not prolonged into snout (Figs. 3 and 4) 3

2(1) Elytra with intervals as wide as or wider than striae; strial punctures small, round to slightly elongate, distinctly separated (Fig. 32). Pronotum with punctures distinctly elongate, about twice as long as wide (Fig. 32). Wings greatly reduced. [Length of body 2.5–4.5 mm; habitus Fig. 193] ..... *Sitophilus granarius* (p.98)

– Elytra with intervals much narrower than striae; strial punctures large, quadrangular, nearly contiguous (Fig. 33). Pronotum with punctures more or less circular or slightly elongate, less than twice as long as wide (Fig. 33). Wings fully developed. [Length of body 3.0–4.6 mm]..... *Sitophilus oryzae* (p.100)

3(1) Head with median ocellus dorsally (Fig. 6) ..... (DERMESTIDAE, part) ... Key D

– Head without median ocellus dorsally (Figs. 7 and 8) 4

4(3) First visible abdominal sternum divided by hind coxae, thus posterior margin obsolescent at middle (Fig. 41)..... CARABIDAE

– First visible abdominal sternum not divided by hind coxae, thus posterior margin entire (difficult to observe in some species with dense pubescence) (Fig. 42)..... 5

5(4) Body ant-like; head with short neck (see Fig. 178)..... (ANTHICIDAE)....Key B

– Body not ant-like; head without neck 6

6(5) Elytra metallic blue or green .....(CLERIDAE)... 7

– Elytra not metallic 8

7(6) Legs pale, yellowish to reddish. [Length of body 3.5–6.0 mm; habitus Fig. 185] .....*Necrobia rufipes* (p.76)

– Legs dark, piceous to black. [Length of body 3.0–5.0 mm]..... *Necrobia violacea* (p.79)

8(6) Elytra short, exposing at least 1 abdominal tergum (Figs. 34–36) 9

– Elytra proportionally longer, covering abdomen or exposing only part of the last visible abdominal tergum (Figs. 32 and 33) 17

9(8) Elytra exposing 4–6 abdominal terga (Fig. 34) ..... STAPHYLINIDAE

– Elytra exposing 1–3 abdominal terga (Figs. 35 and 36).... 10

10(9) Elytra without pubescence or spots (see Fig. 204). Fore tibia markedly expanded (see Fig. 204).... (HISTERIDAE)... 11

– Elytra with pubescence or yellowish spots. Fore tibia not markedly expanded 12

11(10) Last exposed abdominal tergum at least three times as long as preceding one. Prosternum without anterior lobe (Fig. 40). [Length of body 2.2–2.8 mm] ..... *Gnathoncus nanus* (p.128)

– Last exposed abdominal tergum about same length as preceding one. Prosternum with anterior lobe (Fig. 39). [Length of body 2.1–3.2 mm; habitus Fig. 204] ..... *Carcinops pumilio* (p.126)

12(10) Antenna apparently 10-segmented, club apparently 1-segmented (Fig. 9) ..... (RHIZOPHAGIDAE)....13

– Antenna 11-segmented, club absent or 2-, 3-segmented (Figs. 10–21) 14

13(12) Head with deep, elongate foveae dorsally (Fig. 22). Pronotum widest at middle or in posterior half, with distinct protuberance marking posterior angle (Fig. 22). [Length of body 1.7–2.6 mm; habitus Fig. 230] ..... *Monotoma picipes* (p.175)

– Head without foveae dorsally (Fig. 23). Pronotum widest in anterior half, without protuberance marking posterior angle (Fig. 23). [Length of body 1.5–2.0 mm] ..... *Monotoma longicollis* (p.174)

14(12) Antenna with large, compact 3-segmented club (Fig. 10) ..... (NITIDULIDAE)....Key F

– Antenna without distinct club (Fig. 12) or with small, loose, 3-segmented club (Fig. 11) 15

15(14) Antenna with last 3 segments distinctly larger than previous ones (Fig. 11). Eye entire. [Length of body 3.0–4.3 mm; habitus Fig. 179] ..... (ANTHRIBIDAE)... *Araecerus fasciculatus* (p.66)

– Antenna with last 3 segments not distinctly larger than previous ones (Fig. 12). Eye markedly notched at antennal insertion level ..... (BRUCHIDAE).... 16

16(15) Hind femur with large tooth on lower margin, followed by 3–4 smaller teeth; upper margin without tooth (Fig. 44). Length of body 2.0–3.7 mm. Last exposed abdominal tergum with yellowish setae. [Habitus Fig. 182] .... *Acanthoscelides obtectus* (p.72)

– Hind femur without or with small tooth on lower margin; upper margin with large tooth (Fig. 43). Length of body 3.8–5.1 mm. Last exposed abdominal tergum with black and white setae. [Habitus Fig. 183] ..... *Bruchus pisorum* (p.72)

17(8) Pronotum with sublateral carina on each side parallel to lateral margin (Figs. 24 and 29) 18

– Pronotum without sublateral carina (Figs. 25–28) 21

18(17) Elytra with setae on intervals longer than those on striae. Pronotum with sublateral carina curved toward middle anteriorly (Fig. 24). Antenna with distinct 3-segmented club (Fig. 13). Body convex. [Length of body 1.5–1.9 mm; habitus Fig. 203] .... (ENDOMYCHIDAE) ..... *Mycetaea subterranea* (p.124)

– Elytra with setae uniformly very short. Pronotum with sublateral carina not curved toward middle anteriorly (Fig. 29). Antenna without distinct club (Fig. 20). Body flat .... (CUCUJIDAE) 19

19(18) Head with dorsal carina not prolonged transversally near posterior margin[1] (Fig. 3). [Length of body 1.6–2.2 mm] .... *Cryptolestes ferrugineus* (p.90)

– Head with dorsal carina prolonged transversally near posterior margin (Fig. 4) 20

20(19) Second elytral interval with 4 rows of setae (best seen in posterior half at a magnification of 80× or more) (Fig. 38). [Length of body 1.4–1.9 mm] .... *Cryptolestes pusillus* (p.92)

– Second elytral interval with 3 rows of setae (Fig. 37). [Length of body 1.7–2.2 mm; habitus Figs. 190 and 191] .... *Cryptolestes turcicus* (p.92)

21(17) Pronotum with rasp-like teeth on anterior half (see Figs. 180 and 181) ..... (BOSTRICHIDAE) 22

– Pronotum without rasp-like teeth 23

22(21) Pronotum with median pair of shallow depressions near base (see Fig. 180). Elytral setae straight (best seen in lateral view). [Length of body 2.5–3.5 mm; habitus Fig. 180] .... *Dinoderus minutus* (p.68)

[1] It is often necessary to pull the head slightly to observe the character.

– Pronotum without depressions near base (see Fig. 181). Elytral setae curved. [Length of body 2.0–3.0 mm; habitus Fig. 181] ..... *Rhyzopertha dominica* (p.68)

23(21) Pronotum with antennal cavity on anterior margin laterally (Fig. 25). [Length of body 1.2–1.4 mm; habitus Fig. 184] ... . (CERYLONIDAE). . . *Murmidius ovalis* (p.76)

– Pronotum without antennal cavity on anterior margin . . . 24

24(23) Eye divided or incised by side margin of head (Fig. 2) .... (TENEBRIONIDAE, part). . . . Key H

– Eye not divided by side margin of head 25

25(24) Elytra without distinct pubescence 26

– Elytra with distinct pubescence 31

26(25) Elytra with contrasting anterior and postmedian spots (see Fig. 217) (NITIDULIDAE: *Glischrochilus*) Key F, couplet 4

– Elytra without spots 27

27(26) Length of body 6–10 mm. Pronotum with anterior angle hook-like (see Fig. 240). [Habitus Fig. 240] .... (TROGOSITIDAE) . . . . *Tenebroides mauritanicus* (p.196)

– Length of body less than 4 mm. Pronotum with anterior angle not hook-like 28

28(27) Antenna without club or with feebly differentiated 5-segmented club. (Fig. 14) 29

– Antenna with well differentiated 2- or 3-segmented club (Fig. 19) 30

29(28) Antenna nearly as long as body (see Figs. 220 and 221). Elytra not striated and without punctures. Pronotum smooth or with dense pubescence. Body globulose (see Figs. 220 and 221) .... (PTINIDAE: *Gibbium, Mezium*). . . . Key G, couplet 2

– Antenna at least five times shorter than body (see Fig. 237). Elytra striated and with punctures. Pronotum punctate and without pubescence. Body elongate (see Fig. 237) .... (TENEBRIONIDAE: *Palorus*). . . . Key H, couplet 5

30(28) Body oval to rounded. Antennae less than twice as long as maxillary palps. Tarsi 5-segmented . . . HYDROPHILIDAE

– Body elongate. Antennae more than five times longer than maxillary palps. Tarsi 3-segmented .... (LATHRIDIIDAE). . . . Key E

31(25) Antenna without club (Fig. 15) 32
– Antenna with distinct club (Figs. 16–18) 33

32(31) Antennal insertions widely separated, distance between them more than length of first antennal segment (Fig. 7). Antennal segments 4–10 serrate (Fig. 15). [Length of body 2.0–3.5 mm; habitus Fig. 176] ..... (ANOBIIDAE)... *Lasioderma serricorne* (p.57)
– Antennal insertions narrowly separated, distance between them less than length of first antennal segment (Fig. 5). Antennal segments not serrate ..... (PTINIDAE, part)... Key G

33(31) Pronotum with 6 large teeth on lateral margin (Figs. 26 and 27) ..... (CUCUJIDAE: *Oryzaephilus*).... 34
– Pronotum without 6 large teeth on lateral margin, at most lateral margin denticulate, crenulate, or with 1 tooth (Figs. 28, 30, and 31) 35

34(33) Length of temple equal to or more than half vertical diameter of eye (Fig. 26). [Length of body 1.7–3.2 mm] ..... *Oryzaephilus surinamensis* (p.97)
– Length of temple less than half vertical diameter of eye (Fig. 27). [Length of body 2.2–3.1 mm; habitus Fig. 192] ..... *Oryzaephilus mercator* (p.95)

35(33) Pronotum with anterior angle thickened, forming callosity; lateral margin with small tooth (Fig. 31) ..... (CRYPTOPHAGIDAE: *Cryptophagus*)..... Key C, couplets 4–16
– Pronotum with anterior angle not thickened; lateral margin denticulate, slightly crenulate, somewhat angulate or smooth (Figs. 28 and 30) 36

36(35) Pronotum with anterior angle lobed (Fig. 30). [Length of body 1.9–2.5 mm; habitus Fig. 189] ..... (CUCUJIDAE)... *Ahasverus advena* (p.90)
– Pronotum with anterior angle not lobed 37

37(36) Length of body 5.0–10.0 mm ..... (DERMESTIDAE: *Dermestes*).... Key D, couplets 3–7
– Length of body less than 5 mm 38

38(37) Pronotum with deep, transverse, smooth impression basally; lateral margin denticulate (Fig. 28) ..... (CRYPTOPHAGIDAE: *Henoticus*).... Key C, couplet 3
– Pronotum without transverse impression basally; lateral margin not denticulate, at most slightly crenulate 39

39(38) Middle and hind tarsi 3-segmented (Fig. 45) ..... (LATHRIDIIDAE)....Key E

– Middle and hind tarsi 4- or 5-segmented (Figs. 46 and 47) 40

40(39) Middle and hind tarsi 4-segmented (Fig. 46) ..... (MYCETOPHAGIDAE)..... 41

– Middle and hind tarsi 5-segmented (Fig. 47) 43

41(40) Antenna with 4-segmented club (Fig. 16). Pronotum with deep pit on each side near base. Length of body 3.3–4.0 mm. [Habitus Fig. 214] ..... *Mycetophagus quadriguttatus* (p.143)

– Antenna with 3-segmented club (Figs. 17 and 18). Pronotum without or with shallow, indistinct pit on each side near base. Length of body 1.8–3.1 mm 42

42(41) Integument of elytra unicolorous, pale brown to reddish brown. Last antennal segment shorter than two preceding ones combined (Fig. 17). [Length of body 2.0–3.1 mm; habitus Fig. 215] ..... *Typhaea stercorea* (p.146)

– Integument of elytra bicolorous, piceous with yellowish spots. Last antennal segment as long as two preceding ones combined (Fig. 18). [Length of body 1.8–2.2 mm; habitus Fig. 213] ..... *Litargus balteatus* (p.143)

43(40) Body oval to rounded. Antennae less than twice as long as maxillary palps ..... HYDROPHILIDAE

– Body elongate. Antennae more than five times longer than maxillary palps 44

44(43) Antennal insertions widely separated, distance between them more than length of first antennal segment. Head barely or not at all visible from above (Fig. 177). [Length of body 2.0–3.1 mm; habitus Fig. 177] ..... (ANOBIIDAE)....*Stegobium paniceum* (p.59)

– Antennal insertions narrowly separated, distance between them equal to or less than length of first antennal segment (Fig. 8). Head readily visible from above (Fig. 186). [Length of body 1.2–2.2 mm; habitus Fig. 186] ..... (CRYPTOPHAGIDAE)..... *Atomaria* (p.80)

Key B ANTHICIDAE

1(0) Integument of elytra brown to piceous with basal fourth to basal third paler (usually yellowish to reddish), without pale spot on each side behind middle (Fig. 48). Head and pronotum dorsally with microsculpture between punctures 2

– Integument of elytra of different coloration (Fig. 49) or at least with pale spot on each side behind middle (Fig. 50). Head and pronotum without microsculpture between punctures 3

2(1) Pronotum with pair of small median protuberances on anterior fourth. Mesosternum with side markedly bowed outward and fringed with fine appressed setae (Fig. 51). [Length of body 2.6–3.4 mm; habitus Fig. 178] ..... *Anthicus floralis* (p.62)

– Pronotum without median protuberances. Mesosternum with side slightly bowed outward and not fringed with setae (Fig. 52). [Length of body 2.7–3.2 mm] ..... *Anthicus formicarius* (p.64)

3(1) Pronotum with tubercles or longitudinal ridges between punctures (Figs. 53 and 54) 4

– Pronotum without tubercles or ridges between punctures ... 5

4(3) Head dorsally and pronotum with small tubercles between punctures (Fig. 53). Prosternum with dense pubescence anteriorly (as in Fig. 55). [Length of body 2.2–2.8 mm] ..... *Anthicus scabriceps* (p.65)

– Head smooth dorsally; pronotum with short longitudinal ridges between punctures (Fig. 54). Prosternum without dense pubescence anteriorly (as in Fig. 56). [Length of body 2.4–2.9 mm] ..... *Anthicus flavicans* (p.62)

5(3) Prosternum with dense pubescence anteriorly (Fig. 55). [Length of body 2.7–3.7 mm] .... *Anthicus ephippium* (p.61)

– Prosternum without dense pubescence anteriorly (Fig. 56) 6

6(5) Integument of elytra unicolorous, usually piceous to black, rarely brownish (Fig. 49). Elytral pubescence with decumbent setae. [Length of body 2.5–3.5 mm] ..... *Anthicus punctulatus* (p.65)

– Integument of elytra bicolorous, at least with pale spot (yellowish to reddish) on each side behind middle (Fig. 50). Elytral pubescence with suberect setae 7

7(6) Pubescence on anterior half of elytron (except near suture) short and markedly curved, on posterior half short and slightly curved. Hind trochanter of male[2] without spine-like projection. [Length of body 2.5–3.4 mm] .... *Anthicus cervinus* (p.61)

– Pubescence on elytron long and slightly curved. Hind trochanter of male[2] with conspicuous spine-like projection on posterior margin. [Length of body 2.8–3.5 mm] .... *Anthicus hastatus* (p.64)

[2] Males differ from females in having two abdominal terga exposed, instead of one, at the elytral apex (as in Fig. 255).

Key C CRYPTOPHAGIDAE

1(0) Antennae inserted on frons, distance between antennal insertions equal to or less than length of first antennal segment (Fig. 57). [Length of body 1.2–2.2 mm; habitus Fig. 186] ..... *Atomaria* (p.80)

– Antennae inserted under acutely margined sides of frons, distance between antennal insertions more than length of first antennal segment (Fig. 58) 2

2(1) Pronotum with anterior angle not thickened; lateral margins denticulate (Figs. 59 and 60) ..... (*Henoticus*) 3

– Pronotum with anterior angle thickened, forming callosity; lateral margins smooth or slightly crenulate (Figs. 63–74) ..... (*Cryptophagus*) 4

3(2) Pronotum widest near middle; lateral margins evenly arcuate (Fig. 59). Eye larger, less conical (Fig. 59). [Length of body 1.8–2.3 mm; habitus Fig. 188] .... *Henoticus serratus* (p.88)

– Pronotum widest near base; lateral margins asymmetrically arcuate (Fig. 60). Eye smaller, more conical (Fig. 60). [Length of body 2.0–2.4 mm]. . . . *Henoticus californicus* (p.86)

4(2) Elytra with setae unequal in length, smaller setae decumbent, longer ones suberect and conspicuous or, in *C. cellaris*,[3] slightly raised and more or less conspicuous . . . 5

– Elytra with setae subequal in length and decumbent 9

5(4) Eye smaller, conical, somewhat flattened anteriorly (Fig. 63). [Length of body 1.7–2.4 mm] .... *Cryptophagus laticollis* (p.82)

– Eye larger, hemispherical or slightly conical, not flattened anteriorly (Figs. 64–67) 6

6(5) Pronotum with anterior angle drawn out into fine point posteriorly (Fig. 61) 7

– Pronotum with anterior angle not drawn out posteriorly (Fig. 62) 8

7(6) Pronotum rather quadrate; lateral tooth in front of middle of side (Fig. 64). [Length of body 2.2–2.7 mm] .... *Cryptophagus stromus* (p.85)

[3] The species has been inserted in both couplets.

– Pronotum rather transverse; lateral tooth near middle of side (Fig. 65). [Length of body 2.0–3.2 mm] ..... *Cryptophagus pilosus* (p.83)

8(6) Elytra with longer setae suberect and conspicuous. Eye slightly conical, smaller, prominent (Fig. 66). [Length of body 2.0–3.0 mm] ..... *Cryptophagus setulosus* (p.85)

– Elytra with longer setae slightly raised and not conspicuous. Eye hemispherical, longer, less prominent (Fig. 67). [Length of body 2.0–3.0 mm] ..... *Cryptophagus cellaris* (p.82)

9(4) Pronotum wider across anterior angles rather than across lateral teeth (Fig. 68). [Length of body 1.9–2.8 mm] ..... *Cryptophagus acutangulus* (p.80)

– Pronotum wider across lateral teeth rather than across anterior angles (Figs. 69–74) 10

10(9) Pronotum with lateral margins markedly sinuate, concave in front of lateral teeth, convex behind (Fig. 69). [Length of body 2.0–2.5 mm; habitus Fig. 187] ..... *Cryptophagus varus* (p.86)

– Pronotum with lateral margins not sinuate or only slightly so (Figs. 70–74) 11

11(10) Pronotum with anterior angle drawn out into fine point posteriorly (Fig. 61) 12

– Pronotum with anterior angle not drawn out posteriorly (Fig. 62) 13

12(11) Pronotum with lateral margins slightly convergent toward base (Fig. 70). Integument of elytra usually blackish with yellowish to reddish marks, particularly at shoulders and near apex. [Length of body 2.2–2.8 mm] ..... *Cryptophagus obsoletus* (p.82)

– Pronotum with lateral margins distinctly convergent toward base (Fig. 65). Integument of elytra usually uniformly reddish brown. [Length of body 2.0–3.2 mm] ..... *Cryptophagus pilosus* (p.83)

13(11) Elytra with setae unequal in length, longer setae slightly raised and arranged in longitudinal rows. Eye longer, hemispherical (Fig. 67). [Length of body 2.0–3.0 mm] ..... *Cryptophagus cellaris* (p.82)

– Elytra with setae subequal in length. Eye smaller, slightly conical (Figs. 71–74) 14

14(13) Punctation on pronotum sparser, separated by diameter of one puncture or more (Fig. 71). Length of body 1.5–1.8 mm .. .. *Cryptophagus scutellatus* (p.84)

- Punctation of pronotum denser, separated by less than diameter of one puncture (Fig. 72). Length of body 2.0–3.0 mm 15

15(14) Integument of body bicolorous dorsally; head, pronotum, and base of elytra reddish, and rest of elytra blackish. [Length of body 2.0–2.8 mm] ..... *Cryptophagus scanicus* (p.84)
- Integument of body unicolorous dorsally, reddish to reddish brown 16

16(15) Pronotum with anterior angle prominent anteriorly (Fig. 73). [Length of body 2.0–3.0 mm] ..... *Cryptophagus subfumatus* (p.85)
- Pronotum with anterior angle not prominent anteriorly (Fig. 74). [Length of body 2.0–2.8 mm] ..... *Cryptophagus saginatus* (p.83)

Key D DERMESTIDAE

1(0) Antenna without club (see Figs. 193 and 194). Abdomen with 7 visible abdominal sterna. Male with soft and dehiscent elytra apically (Fig. 193); female larviform, without hind wings and elytra (Fig. 194). [Length of body 2.0–3.0 mm; habitus Figs. 200 and 201] ..... *Thylodrias contractus* (p.116)

– Antenna with club. Abdomen with 5 visible abdominal sterna. Elytra in both sexes hard and not dehiscent (see Figs. 194–199) 2

2(1) Head without ocellus (Fig. 75). Length of body 5.5–12.0 mm ..... (*Dermestes*) ... 3

– Head with ocellus dorsally (Figs. 76–78). Length of body usually less than 5.5 mm 8

3(2) Margin of elytron serrulate apically, apex spiniform (Fig. 97). [Length of body 5.5–10 mm; habitus Fig. 197] ..... *Dermestes maculatus* (p.109)

– Margin of elytron more or less smooth apically, apex rounded (Fig. 98) 4

4(3) Metepisternum with small patch of black setae contrasting against background of white setae. Abdominal sterna with black and white setae producing distinct pattern (Figs. 79 and 80). First abdominal sternum with lateral sulcus not extended to posterior margin of segment (Figs. 79 and 80) 5

– Metepisternum without contrasting patch of black setae. Abdominal sterna with setae not producing clear pattern (Figs. 81 and 82). First abdominal sternum with lateral sulcus extended to posterior margin of segment (Figs. 81 and 82) 6

5(4) Lateral part of pronotum almost entirely clothed with white setae. Elytra without transverse band of white setae at basal third. Male with median tuft of setae on fourth visible abdominal sternum only. Length of body 6–10 mm ..... *Dermestes frischii* (p.108)

– Lateral part of pronotum clothed with dark brown and golden setae. Elytra with broad transverse band of white setae at basal third. Male with median tuft of setae on third and fourth visible abdominal sterna (Fig. 261). Length of body 10–12 mm ..... *Dermestes marmoratus* (p.112)

6(4) Elytra covered with pale setae scattered among darker setae; scutellum with pale setae. Lateral sulcus of first visible abdominal sternum curved medially on anterior half (Fig. 81). [Length of body 7–9 mm] ..... *Dermestes ater* (p.108)

– Elytra covered mostly with white or golden setae on basal half (usually with 1–3 small patches of dark setae); scutellum with dark setae. Lateral sulcus of first visible abdominal sternum parallel to lateral margin on anterior half (Fig. 82) 7

7(6) Apical half of elytra clothed with dark setae, basal half with contrasting subbasal transverse band of white setae. Pronotum with predominantly dark setae and small patches of pale ones. [Length of body 7–9 mm; habitus Fig. 196] ..... *Dermestes lardarius* (p.109)

– Apical half of elytra clothed with black and golden setae (sometimes mostly golden setae), basal half without contrasting transverse band of white setae. Pronotum with golden setae except for 2–3 small patches of dark ones. [Length of body 6–8 mm] ..... *Dermestes signatus* (p.112)

8(2) Vestiture of body consisting of flat, conspicuous scales (Figs. 93 and 94) ..... (*Anthrenus*) ... 9

– Vestiture of body consisting of setae 12

9(8) Antenna 11-segmented, club 3-segmented (Fig. 84). First visible abdominal sternum with coxal lines (Fig. 83) 10

– Antenna 5- or 8-segmented, club 1- or 2-segmented (Figs. 85 and 86). First visible abdominal sternum without coxal lines 11

10(9) Eye with medial margin notched (Fig. 77). Scales on body ovate, less than twice as long as broad (Fig. 93). [Length of body 2.0–3.8 mm; habitus Fig. 194] ..... *Anthrenus scrophulariae* (p.103)

– Eye with medial margin entire (Fig. 78). Scales on body elongate, more than twice as long as broad (Fig. 94). [Length of body 1.7–3.2 mm] ..... *Anthrenus verbasci* (p.105)

11(9) Antenna 5-segmented, club 1-segmented (Fig. 86). [Length of body 1.7–2.8 mm] ..... *Anthrenus fuscus* (p.102)

– Antenna 8-segmented, club 2-segmented (Fig. 85). [Length of body 2.5–3.1 mm] ..... *Anthrenus museorum* (p.103)

12(8) Integument of elytra dark brown anteriorly and along suture, light brown on posterior two-thirds; these zones separated by oblique yellowish band. [Length of body 2.0–4.0 mm; habitus Fig. 199] ..... *Reesa vespulae* (p.113)

– Integument of elytra of different coloration and without oblique yellowish band 13

13(12) Antennal cavity on ventral surface of prothorax not carinate posteriorly (Fig. 89) 14
– Antennal cavity on ventral surface of prothorax carinate posteriorly (Fig. 90) ..... (*Trogoderma*) 15

14(13) Elytral vestiture of white, golden brown, and black setae producing distinct pattern. Disc of pronotum with large, deep punctures separated by less than their diameter (Fig. 91). Hind tarsus with first segment subequal in length to second. [Length of body 2.9–4.9 mm; habitus Fig. 198] .... *Megatoma variegata* (p.113)
– Elytral vestiture of rather uniformly dark brown to black setae not producing any pattern. Disc of pronotum with very small, shallow punctures separated by more than their diameter (Fig. 92). Hind tarsus with first segment no more than half as long as second. [Length of body 2.8–5.0 mm; habitus Fig. 195] ..... *Attagenus unicolor* (p.105)

15(13) Integument of elytra unicolorous or nearly so (vaguely mottled), without clearly defined pattern[4] 16
– Integument of elytra bicolorous, with defined pattern (Figs. 95 and 96) 18

16(15) Integument of elytra light yellowish brown to dark reddish brown; pronotum usually darker than elytra.[4] [Length of body 1.8–3.8 mm] ..... *Trogoderma granarium* (p.120)
– Integument of elytra dark piceous to black (sometimes with brownish spots on humeral and apical parts); pronotum not darker than elytra 17

17(16) Setae on dorsum unicolorous, brownish to piceous. [Length of body 2.6–4.0 mm] ..... *Trogoderma sinistrum* (p.121)
– Setae on dorsum of two or three colors, brownish to piceous, white, and golden. [Length of body 2.0–4.0 mm; habitus Fig. 202] ..... *Trogoderma glabrum* (p.116)

18(15) Eye with medial margin notched (Fig. 76). [Length of body 2.0–5.0 mm] ..... *Trogoderma inclusum* (p.120)
– Eye with medial margin entire or only slightly notched ... 19

[4] Be careful not to confuse the coloration of the integument with that of the setae.

19(18) Basal and submedian bands of elytron not joined by longitudinal line (Fig. 95). Males[5] with antennal club not serrate (Fig. 87). [Length of body 2.0–4.6 mm] .....
..... *Trogoderma variabile* (p.122)

– Basal and submedian bands of elytron joined by longitudinal line or lines (Fig. 96). Males[5] with antennal club serrate (Fig. 88). [Length of body 2.4–4.0 mm] .....
..... *Trogoderma sternale* (p.121)

[5] Males differ from females in having the antennal club seemingly 6- or 8-segmented instead of 4-segmented (see Figs. 251 and 252).

Key E LATHRIDIIDAE

1(0) Elytra with distinct pubescence (best seen at magnification of 40× or more) (Fig. 99) 2
– Elytra without distinct pubescence (at most with minute setae barely visible at 40×) (Figs. 100–101) 4

2(1) First visible abdominal sternum with coxal lines (Fig. 102). Pronotum near base with transverse impression extended to lateral margins. [Length of body 1.3–2.0 mm; habitus Fig. 211] ..... *Melanophthalma* (p.140)
– First visible abdominal sternum without coxal lines (Figs. 103–104). Pronotum near base with more or less circular median impression not extended to lateral margins 3

3(2) First segment of hind tarsus markedly produced ventrally, nearly extended to apex of second segment (Fig. 105). Abdomen with 6 visible sterna (Fig. 103). [Length of body 1.1–2.0 mm] ..... *Corticarina* (p.132)
– First segment of hind tarsus barely produced ventrally, not extended to apex of second segment (Fig. 106). Abdomen with 5 visible abdominal sterna (Fig. 104). [Length of body 1.5–3.0 mm; habitus Fig. 207] ..... *Corticaria* (p.132)

4(1) Antenna with 2-segmented club (Fig. 107) 5
– Antenna with 3-segmented club (Fig. 108) 6

5(4) Pronotum markedly constricted at basal third, with longitudinal ridges on each side of middle (Fig. 109). Temple about as long as vertical diameter of eye (Fig. 109). [Length of body 1.2–1.7 mm; habitus Fig. 206] ..... *Cartodere constricta* (p.129)
– Pronotum with sides sinuate at basal third, without longitudinal ridges (Fig. 110). Temple absent (Fig. 110). [Length of body 1.2–1.7 mm] ..... *Dienerella filum* (p.135)

6(4) Eye separated from antennal insertion by less than its diameter (best seen in lateral aspect) (Fig. 111). Elytron with seventh interval carinate or swelled near shoulder 7
– Eye separated from antennal insertion by more than its diameter (Figs. 112 and 113). Elytron with seventh interval more or less flat near shoulder ..... (*Dienerella*) 11

7(6) Pronotum markedly constricted on basal third. Elytra wavy, third interval with longitudinal swelling on apical third (see Fig. 205). [Length of body 1.6–2.2 mm; habitus Fig. 205] ..... *Aridius nodifer* (p.129)
– Pronotum with sides rounded or sinuate on basal third. Elytra not wavy, third interval without longitudinal swelling 8

8(7) Elytron with 4 rows of punctures on posterior half between seventh interval and lateral margin (Fig. 114). Elytron with fifth, seventh, and usually also third intervals carinate. [Length of body 1.8–2.2 mm; habitus Fig. 212] .... *Thes bergrothi* (p.140)

– Elytron with 2 rows of punctures on posterior half between seventh interval and lateral margin (Fig. 115). Elytron with third, fifth, and (except near shoulder) seventh intervals flat or at most convex 9

9(8) Pronotum narrowed near middle; anterior angles produced (Fig. 116). Intercoxal process of prosternum more or less flat. [Length of body 1.4–2.4 mm; habitus Fig. 210] .... *Lathridius minutus* (p.137)

– Pronotum more or less widened near middle; anterior angles not produced (Fig. 117). Intercoxal process of prosternum keeled .....(*Enicmus*).... 10

10(9) Metasternum impunctate or nearly so, at most with few punctures posteriorly (Fig. 122). First visible abdominal sternum with longitudinal rugae on anterior half (Fig. 122). [Length of body 1.6–2.0 mm; habitus Fig. 209] .... *Enicmus fictus* (p.135)

– Metasternum punctate on posterior areas (Fig. 123). First visible abdominal sternum punctate, without rugae (Fig. 123). [Length of body 1.7–2.0 mm] ..... *Enicmus mimus* (p.137)

11(6) Pronotum markedly constricted on basal third (Fig. 118). Elytron with 7 rows of punctures. [Length of body 1.0–1.2 mm; habitus Fig. 208] ..... *Dienerella ruficollis* (p.135)

– Pronotum with sides convergent or slightly sinuate on basal third (Fig. 119). Elytron with 8 rows of punctures at least on anterior half 12

12(11) Eye proportionally larger, consisting of about 15 facets (Fig. 112). [Length of body 1.2–1.4 mm] ....*Dienerella arga* (p.134)

– Eye proportionally smaller, consisting of about 4 facets (Fig. 113) 13

13(12) Elytron with fifth and sixth striae complete, extended to apex (Fig. 120). Elytron with third, fifth, and seventh intervals slightly carinate. [Length of body 1.1–1.5 mm] ....*Dienerella costulata* (p.134)

– Elytron with fifth and sixth striae coalescent near middle (Fig. 121). Elytron with third, fifth, and seventh intervals not carinate. [Length of body 1.2–1.4 mm] .... *Dienerella filiformis* (p.134)

Key F NITIDULIDAE

1(0) Abdomen with 2 exposed terga (Fig. 124) ..... (*Carpophilus*) 2
– Abdomen with 1 exposed tergum (Figs. 125 and 126) 3

2(1) Elytron with humeral and large apical yellowish spots (Fig. 124). [Length of body 2.0–4.1 mm; habitus Fig. 216] .... *Carpophilus hemipterus* (p.148)
– Elytron without spots. [Length of body 1.8–2.5 mm] ..... *Carpophilus brachypterus* (p.148)

3(1) Pronotum and elytra without distinct pubescence. Elytron with 2 sharply contrasting, large, pale spots (Figs. 125 and 126). ..... (*Glischrochilus*) 4
– Pronotum and elytra with distinct pubescence at least laterally. Elytron differently colored (Figs. 127–130) 5

4(3) Elytron with anterior spot subquadrate, postmedian spot more or less oval (Fig. 125). [Length of body 4–7 mm; habitus Fig. 217] ..... *Glischrochilus quadrisignatus* (p.150)
– Elytron with anterior spot trilobed, postmedian spot more or less transverse (Fig. 126). [Length of body 4–7 mm] ..... *Glischrochilus fasciatus* (p.150)

5(3) Antennal cavity on ventral side of head not widened behind level of eye (Fig. 131). Disc of pronotum without depression ..... (*Nitidula*) 6
– Antennal cavity on ventral side of head widened behind level of eye (Fig. 132). Disc of pronotum with 2 shallow depressions medially near base ..... (*Omosita*) 7

6(5) Elytron brown to piceous with obscure, rounded, yellowish brown to reddish orange spot near suture at middle (Fig. 127). Pronotal and elytral fringes short (Fig. 127). [Length of body 3.0–5.0 mm; habitus Fig. 218] ..... *Nitidula bipunctata* (p.152)
– Elytron brown with more than one spot, usually 3 basal longitudinal spots and one sigmoid spot (Fig. 128). Pronotal and elytral fringes longer (Fig. 128). [Length of body 3.0–5.0 mm] ..... *Nitidula ziczac* (p.152)

7(5) Elytra mainly dark on anterior half and mainly pale in posterior half (Fig. 129). [Length of body 2.0–3.5 mm; habitus Fig. 219] ..... *Omosita colon* (p.154)
– Elytra mainly pale on anterior two-thirds and mainly dark on posterior third (Fig. 130). [Length of body 2.0–3.2 mm] ..... *Omosita discoidea* (p.154)

Key G PTINIDAE

1(0) Elytra without setae or scales, except for narrow collar of golden setae and sometimes a few restricted setae in *Mezium* 2

– Elytra with setae or scales (or both) uniformly distributed ... 3

2(1) Pronotum without setae. [Length of body 1.7–3.2 mm; habitus Fig. 220] ..... *Gibbium aequinoctiale* (p.156)

– Pronotum with very dense golden setae. [Length of body 2.3–3.5 mm; habitus Fig. 221] ..... *Mezium affine* (p.158)

3(1) Pronotum with scales and setae; lateral margins rounded on posterior half (Fig. 133). [Length of body 1.6–2.9 mm; habitus Fig. 227] ..... *Sphaericus gibboides* (p.169)

– Pronotum with setae; lateral margins constricted on posterior half (Figs. 134–137) 4

4(3) Area between antennal insertions wider (width at least half the length of first antennal segment), flat (Figs. 138 and 139) 5

– Area between antennal insertions narrower (width less than one-quarter the length of first antennal segment), usually cariniform (Figs. 140 and 141) 7

5(4) Elytra moderately hairy; strial punctures clearly distinct (see Fig. 228). [Length of body 1.8–3.1 mm; habitus Fig. 228] ..... *Tipnus unicolor* (p.169)

– Elytra densely hairy; strial punctures indistinct (unless specimen is rubbed) (see Figs. 215 and 222) 6

6(5) Elytra with golden yellow setae. Hind femur as long as tibia. [Length of body 3.0–4.5 mm; habitus Fig. 222] .... *Niptus hololeucus* (p.158)

– Elytra with golden setae and patches of darker (often nearly black) ones (see Fig. 222). Hind femur shorter than tibia. [Length of body 2.0–4.0 mm; habitus Fig. 229] .... *Trigonogenius globulus* (p.172)

7(4) Scutellum small, indistinct, almost vertical. Hind trochanter extended to elytral margin (Fig. 142). [Length of body 2.0–3.0 mm; habitus Fig. 223] .... *Pseudeurostus hilleri* (p.161)

– Scutellum large, distinct, on same plane as adjacent parts of elytra. Hind trochanter not extended to elytral margin (Fig. 143) ..... (*Ptinus*) 8

8(7) Elytra densely hairy, strial punctures and intervals indistinct (unless specimen is rubbed) (Fig. 226). Vestiture of scutellum as dense, and of same color, as adjacent parts of elytra. [Length of body 2.5–4.0 mm; habitus Fig. 226] ..... *Ptinus ocellus* (p.166)

– Elytra moderately hairy, strial punctures and intervals distinct (Fig. 225). Vestiture of scutellum denser and whiter than adjacent parts of elytra 9

9(8) Elytron without scales (with subhumeral patch of appressed pale yellow to white setae in some specimens). [Length of body 2.3–3.2 mm] ..... *Ptinus clavipes* (p.163)

– Elytron with subbasal and subapical patches of appressed, elongate, white scales[6] (Figs. 224 and 225) 10

10(9) Erect setae of elytral intervals unequal in length, third, fifth, and seventh intervals with some setae about twice as long as those of other intervals (Fig. 144). [Length of body 2.2–4.0 mm] ..... *Ptinus villiger* (p.168)

– Erect setae of elytral intervals subequal in length, or some setae on third, fifth, and seventh intervals slightly longer than (less than twice as long as) those of other intervals (Fig. 145) 11

11(10) Disc of pronotum with more or less evenly distributed setae, without distinct tufts of erect ones along midline (Fig. 134). [Length of body 2.2–3.5 mm] ..... *Ptinus bicinctus* (p.161)

– Disc of pronotum with 2 tufts of erect golden setae (Figs. 135–137) 12

12(11) Disc of pronotum between tufts of setae shiny, without punctures or granules (Fig. 135). [Length of body 3.0–4.0 mm] ..... *Ptinus raptor* (p.168)

– Disc of pronotum between tufts of setae dull, with punctures and granules (Figs. 136 and 137). [Length of body 2.0–4.3 mm; habitus Figs. 224 and 225] ..... *Ptinus fur* (p.163)

[6] Scales are easily abraded, but in all specimens studied some scales are still present on either the subbasal or the subapical patch.

Key H TENEBRIONIDAE

1(0) Integument of elytra bicolorous, reddish brown with transverse yellow spots. [Length of body 2.2–3.1 mm; habitus Fig. 232] ..... *Alphitophagus bifasciatus* (p.179)
– Integument of elytra unicolorous 2

2(1) Length of body more than 10 mm ..... (*Tenebrio*) 3
– Length of body less than 8 mm 4

3(2) Clypeus, frons, and disc of pronotum with punctures confluent or separated by distance usually shorter than diameter of one puncture (Fig. 159). Dorsum dull. [Length of body 13–17 mm] ..... *Tenebrio obscurus* (p.190)
– Clypeus, frons, and disc of pronotum with punctures not confluent, separated by distance usually greater than diameter of one puncture (Fig. 160). Dorsum more or less shiny. [Length of body 12–17 mm; habitus Fig. 238] ..... *Tenebrio molitor* (p.188)

4(2) Eye entire, not incised by side margin of head (Fig. 146) ..... (*Palorus*) 5
– Eye incised or divided by side margin of head (Figs. 147–149) 6

5(4) Margin of gena somewhat angulate laterally, lower than margin of clypeus anteriorly (Fig. 150). Gena on same level as frons near eye. [Length of body 2.3–3.0 mm; habitus Fig. 237] ..... *Palorus ratzeburgii* (p.184)
– Margin of gena rounded laterally, at same level or slightly higher than margin of clypeus anteriorly (Fig. 151). Gena reflexed near eye. [Length of body 2.5–3.0 mm] ..... *Palorus subdepressus* (p.188)

6(4) Eye divided by side margin of head (Fig. 147). [Length of body 4.0–5.5 mm; habitus Fig. 233] ..... *Blapstinus substriatus* (p.181)
– Eye incised by side margin of head (Figs. 148 and 149) 7

7(6) Pronotum with lateral bead continuous over anterior margin (generally obsolete at middle) (Figs. 162–164). Elytra with intervals flat 8
– Pronotum with lateral bead not continuous over anterior margin (Fig. 161). Elytra with intervals finely, though usually distinctly, carinate ..... (*Tribolium*) 11

8(7) Pronotum with basal margin markedly sinuate (Figs. 162 and 163). Disc of pronotum without or with faint microsculpture between punctures. Body rather broad (Fig. 231) ..... (*Alphitobius*) 9

– Pronotum with basal margin straight or slightly sinuate (Fig. 164). Disc of pronotum with strong microsculpture between punctures. Body rather narrow (Figs. 234–236] ... 10

9(8) Eye about 3 facets wide laterally (as in Fig. 148). Pronotum with lateral margin subparallel toward posterior angle, basal bead usually incomplete at middle (Fig. 162). [Length of body 5.5–7.0 mm; habitus Fig. 231] .... *Alphitobius diaperinus* (p.177)

– Eye about 1 facet wide laterally (as in Fig. 149). Pronotum with lateral margin rounded toward posterior angle, basal bead complete (Fig. 163). [Length of body 4.5–6.7 mm] .... *Alphitobius laevigatus* (p.179)

10(8) Eye 1 or 2 facets wide laterally (as in Fig. 149). Male with conspicuous projection on each mandible (Fig. 235). Length of body 3.5–4.5 mm. [Habitus Figs. 235 and 236] .... *Gnatocerus cornutus* (p.184)

– Eye 3 or 4 facets wide laterally (as in Fig. 148). Male without projection on mandible. Length of body 5–6 mm. [Habitus Fig. 234] ..... *Cynaeus angustus* (p.181)

11(7) Eye 3 or 4 facets wide laterally (Fig. 148). Antenna with moderately compact 3-segmented club (Fig. 165) 12

– Eye 1 or 2 facets wide laterally (Fig. 149). Antenna with loose 5- or 6-segmented club (Fig. 166) 14

12(11) Eye larger, extended ventrally to level of maxillary fossa (Fig. 156). Last antennal segment arcuate (Fig. 167). Dorsum reddish brown. [Length of body 2.3–4.4 mm] .... *Tribolium castaneum* (p.191)

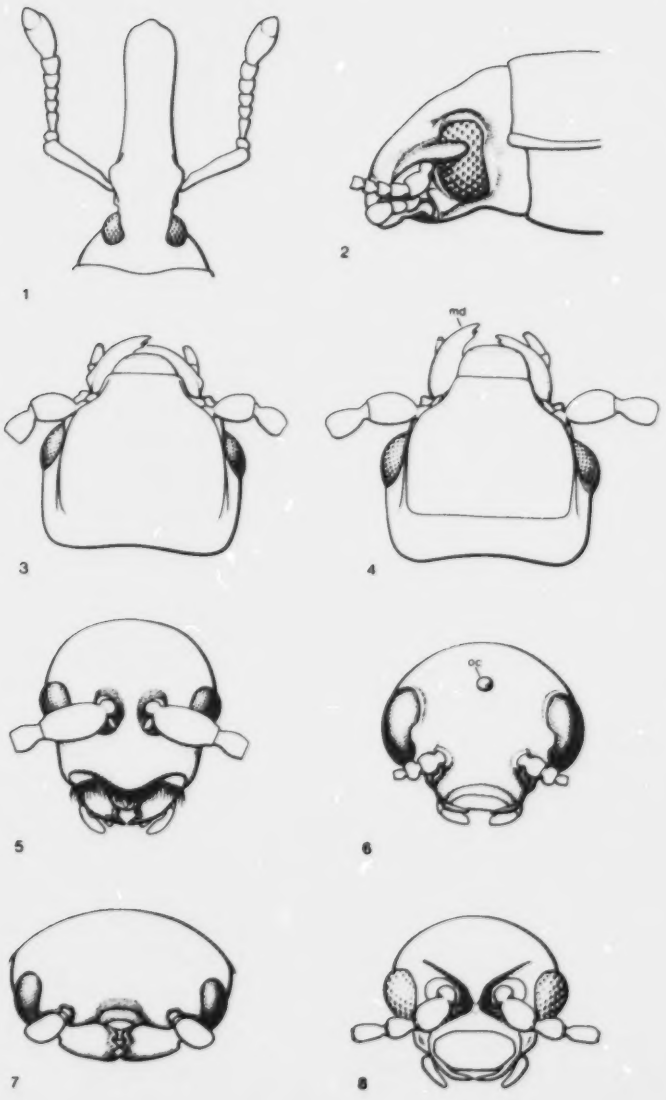
– Eye smaller, not extended ventrally to level of maxillary fossa (Figs. 157 and 158). Last antennal segment subtruncate (Fig. 168). Dorsum dark brown or black 13

13(12) Prosternum slightly depressed in front of intercoxal process. Frons with punctures denser, usually separated by distance shorter than diameter of puncture (Fig. 152). Eye smaller, more or less rounded ventrally (Fig. 157). [Length of body 2.8–4.5 mm] ..... *Tribolium audax* (p.190)

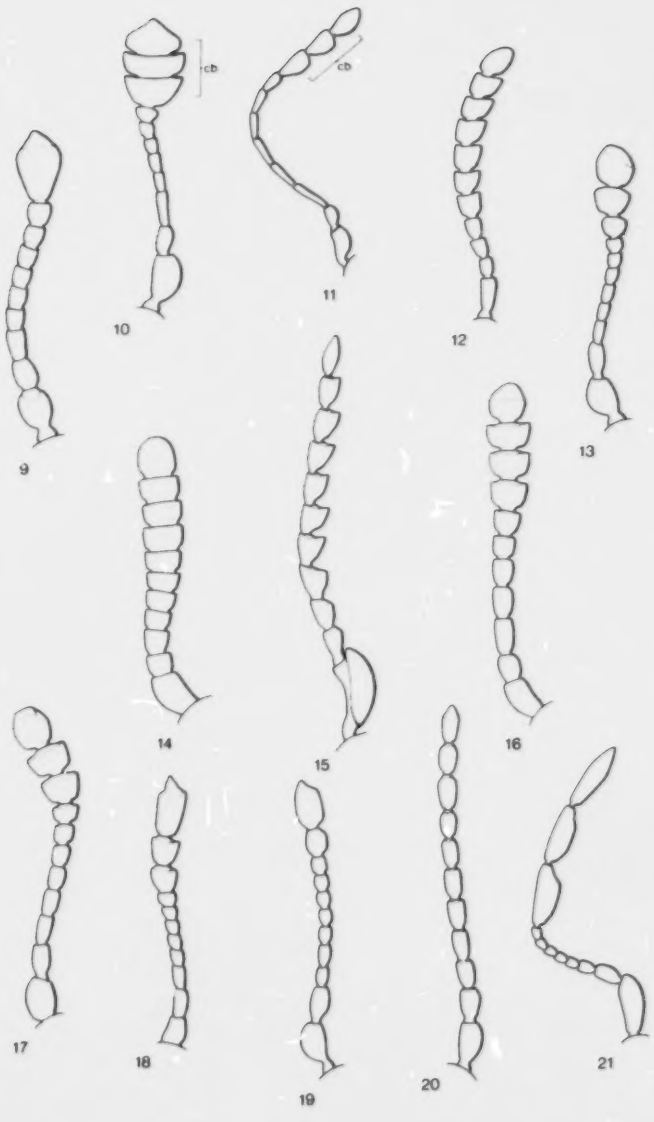
– Prosternum slightly convex in front of intercoxal process. Frons with punctures sparser, usually separated by distance greater than diameter of puncture (Fig. 153). Eye larger, more or less oval ventrally (Fig. 158). [Length of body 3.9–5.1 mm] ..... *Tribolium madens* (p.194)

14(11) Length of body 4.5–5.7 mm. Margin of gena rounded at level of eye (Fig. 154). Pronotum usually widest at middle or behind ..... *Tribolium destructor* (p.192)

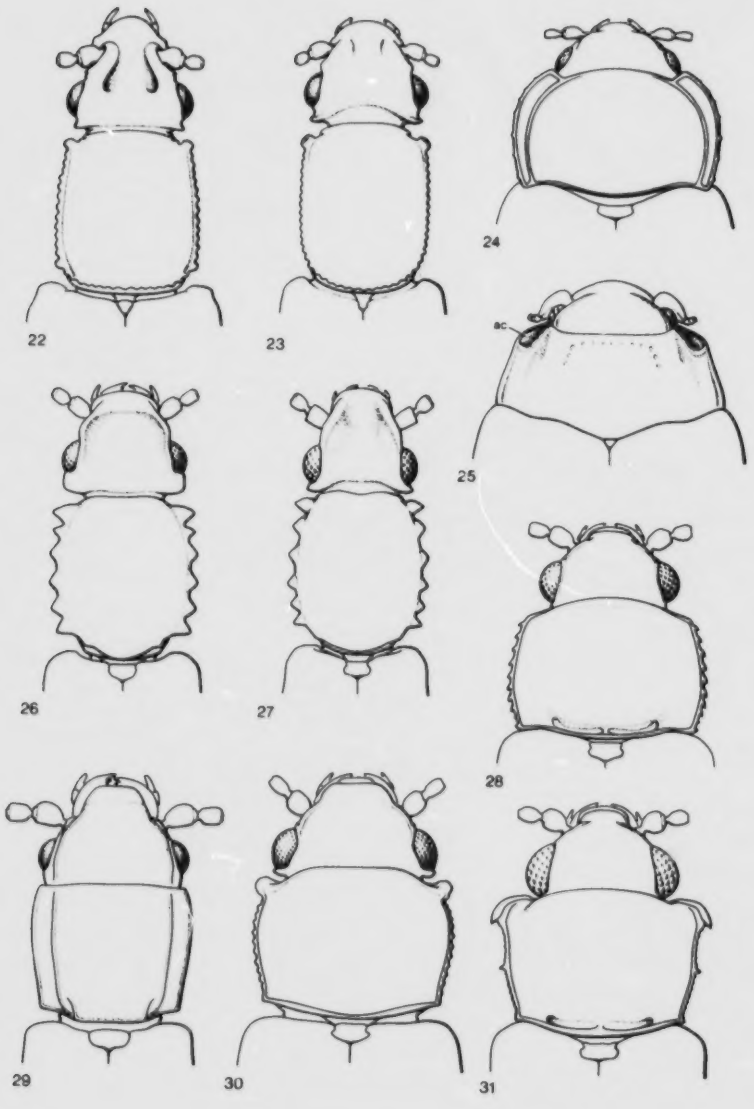
– Length of body 2.6–4.4 mm. Margin of gena subangulate at level of eye (Fig. 155). Pronotum usually widest before middle. [Habitus Fig. 239] ..... *Tribolium confusum* (p.192)



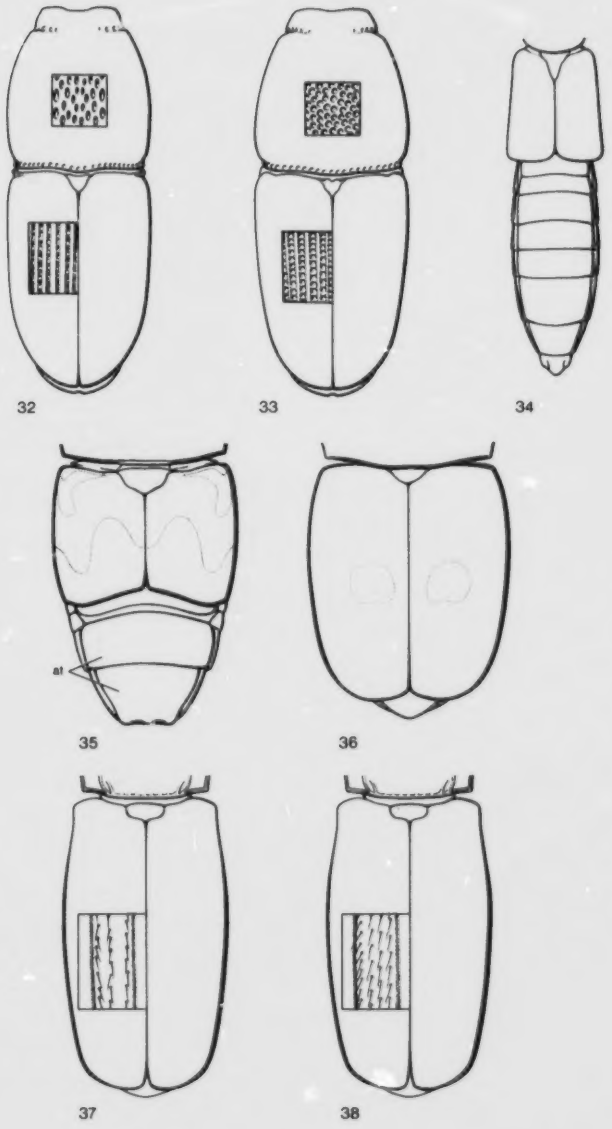
Figs. 1–8 Head. (1) *Sitophilus granarius* (dorsal view); (2) *Tribolium confusum* (lateral view); (3) *Cryptolestes ferrugineus* (dorsal view); (4) *Cryptolestes turcicus* (dorsal view); (5) *Ptinus ocellus* (frontal view); (6) *Trogoderma inclusum* (frontal view); (7) *Lasioderma serricorne* (frontal view); (8) *Atomaria aleutica* (frontal view). **Abbreviations: md, mandible; oc, ocellus.**



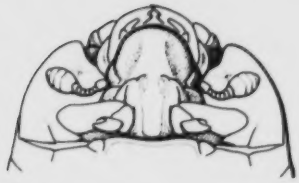
Figs. 9–21 Antenna (dorsal view). (9) *Monotoma picipes*; (10) *Nitidula ziczac*; (11) *Araecerus fasciculatus*; (12) *Bruchus pisorum*; (13) *Mycetaea subterranea*; (14) *Palorus ratzeburgii*; (15) *Lasioderma serricorne*; (16) *Mycetophagus quadriguttatus*; (17) *Typhaea stercorea*; (18) *Litargus balteatus*; (19) *Dienerella filum*; (20) *Cryptolestes turcicus*; (21) *Stegobium paniceum*.
Abbreviation: cb, club.



Figs. 22–31 Head and pronotum. (22) *Monotoma picipes*; (23) *Monotoma longicollis*; (24) *Mycetaea subterranea*; (25) *Murmidius ovalis*; (26) *Oryzaephilus surinamensis*; (27) *Oryzaephilus mercator*; (28) *Henoticus serratus*; (29) *Cryptolestes turcicus*; (30) *Ahasverus advena*; (31) *Cryptophagus acutangulus*.
Abbreviation: ac, antennal cavity.



Figs. 32–38 Pronotum and elytra of (32) *Sitophilus granarius* and (33) *Sitophilus oryzae*; elytra and exposed abdominal terga of (34) *Leptacinus intermedius*, (35) *Carpophilus hemipterus*, (36) *Omosita colon*, (37) *Cryptolestes turcicus*, and (38) *Cryptolestes pusillus*.
Abbreviation: at, abdominal terga.



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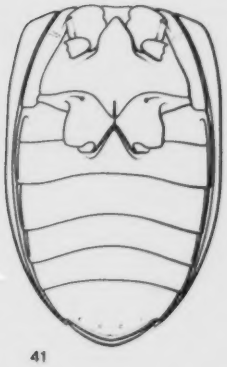

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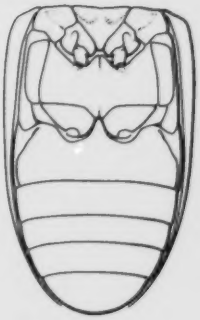

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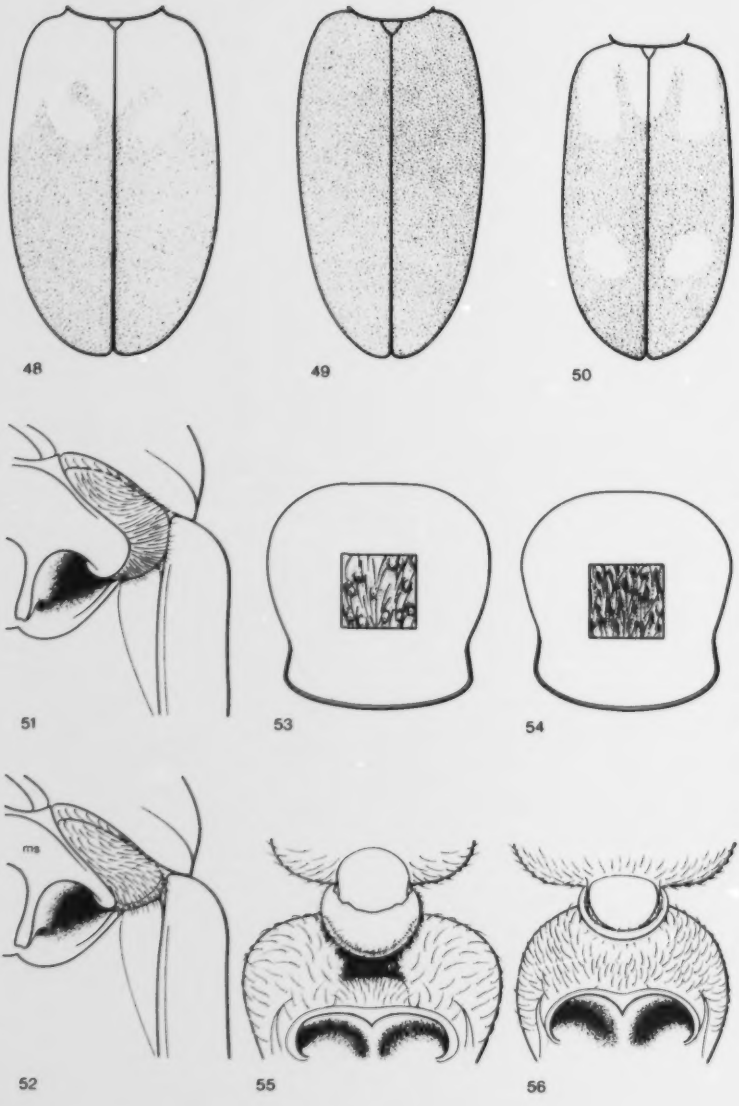
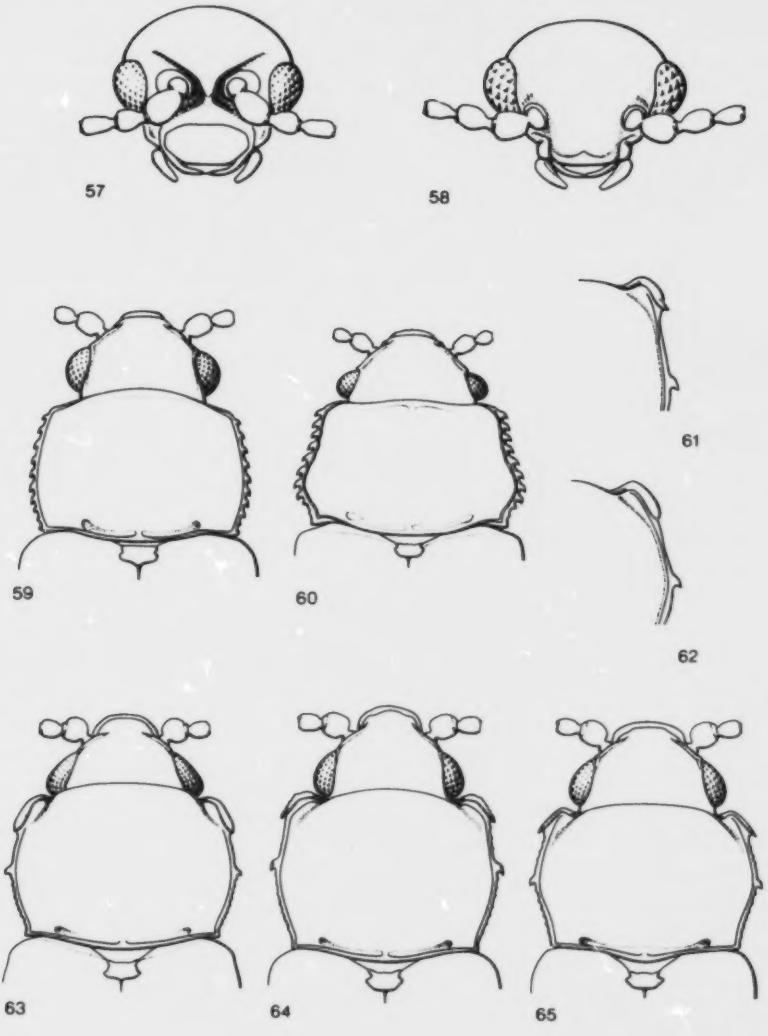
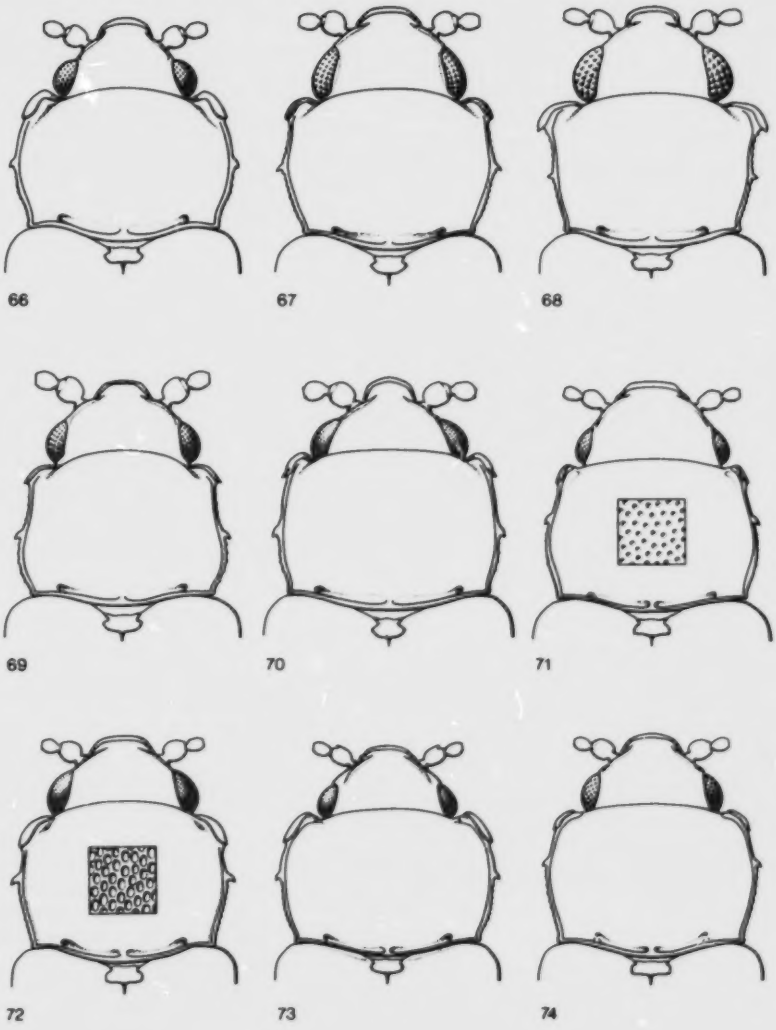
Figs. 39–47 Head and prothorax (ventral view) of (39) *Carcinops pumilio* and (40) *Gnathoncus nanus*; mesothorax, metathorax, and abdomen (ventral view) of (41) *Pterostichus melanarius* and (42) *Dermestes ater*; hind femur (ventral view) of (43) *Bruchus pisorum* and (44) *Acanthoscelides obtectus*; hind tarsus of (45) *Melanophthalma distinguenda*, (46) *Mycetophagus quadriguttatus*, and (47) *Stegobium paniceum*.



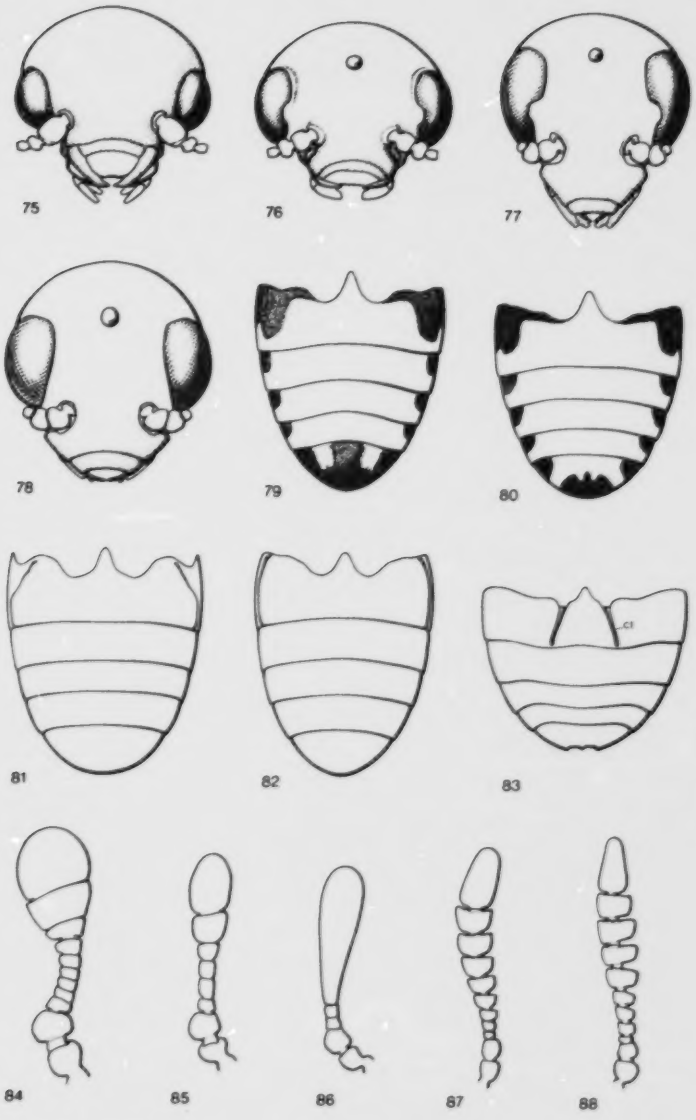
Figs. 48–56 Elytra of (48) *Anthicus formicarius*, (49) *Anthicus punctulatus*, and (50) *Anthicus cervinus*; mesothorax (left half, ventral view) of (51) *Anthicus floralis* and (52) *Anthicus formicarius*; pronotum of (53) *Anthicus scabriceps* and (54) *Anthicus flavicans*. Prothorax (ventral view) of (55) *Anthicus ephippium* and (56) *Anthicus cervinus*.
Abbreviation: ms, mesosternum.



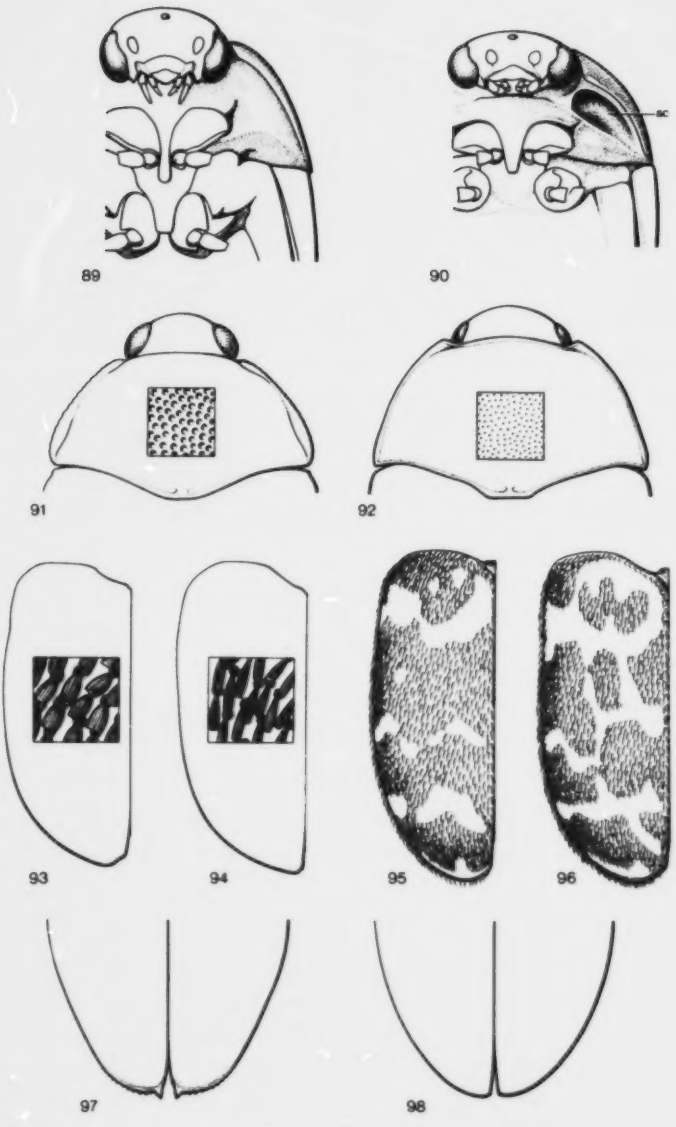
Figs. 57–65 Head (frontal view) of (57) *Atomaria aleutica* and (58) *Cryptophagus acutangulus*; head and pronotum of (59) *Henoticus serratus* and (60) *Henoticus californicus*; anterior angle of pronotum of (61) *Cryptophagus obsoletus* and (62) *Cryptophagus setulosus*; head and pronotum of (63) *Cryptophagus laticollis*, (64) *Cryptophagus stromus*, and (65) *Cryptophagus pilosus*.



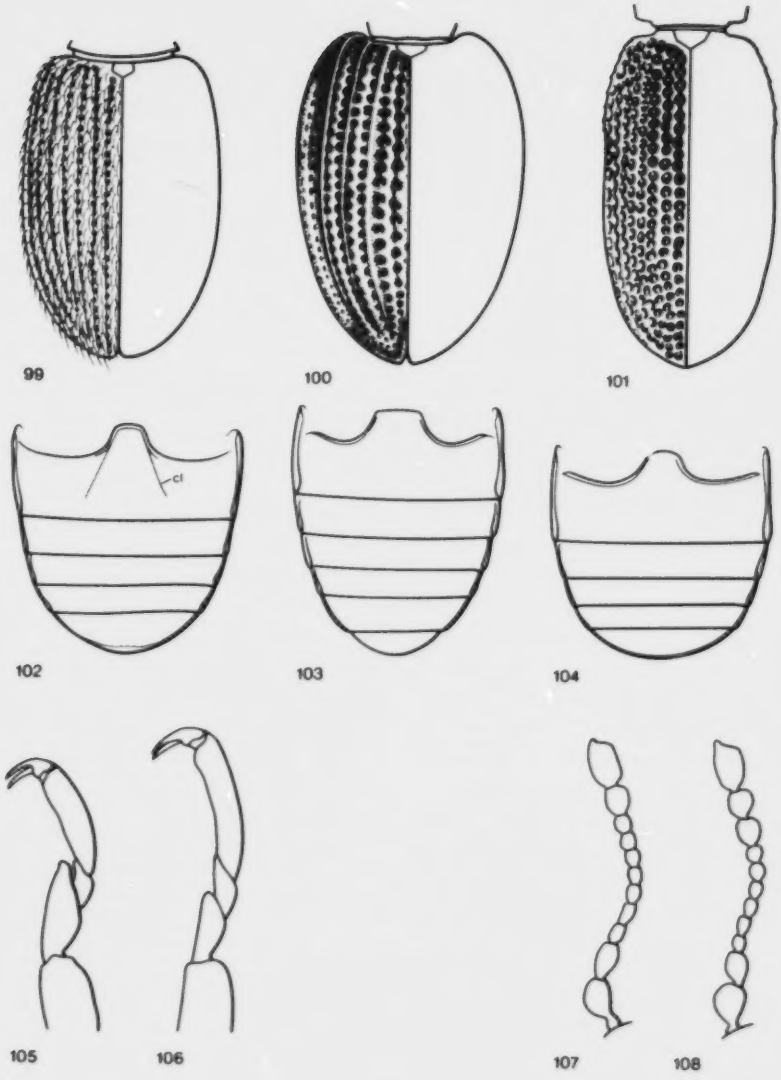
Figs. 66–74 Head and pronotum. (66) *Cryptophagus setulosus*; (67) *Cryptophagus cellaris*; (68) *Cryptophagus acutangulus*; (69) *Cryptophagus varus*; (70) *Cryptophagus obsoletus*; (71) *Cryptophagus scutellatus*; (72) *Cryptophagus scanicus*; (73) *Cryptophagus subfumatus*; (74) *Cryptophagus saginatus*.



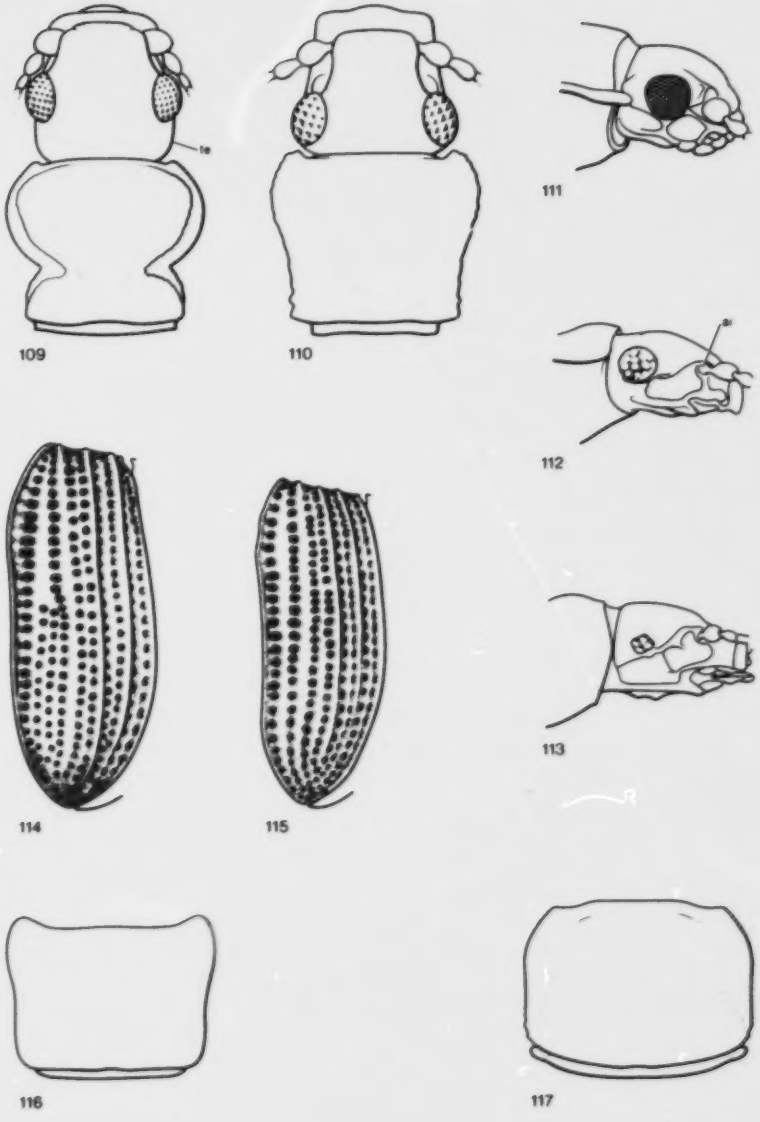
Figs. 75–88 Head (frontal view) of (75) *Dermestes lardarius*, (76) *Trogoderma inclusum*, (77) *Anthrenus scrophulariae*, and (78) *Anthrenus verbasci*; abdomen (ventral view) of (79) *Dermestes maculatus*, (80) *Dermestes frischii*, (81) *Dermestes ater*, (82) *Dermestes lardarius*, and (83) *Anthrenus scrophulariae*; antenna (dorsal view) of (84) *Anthrenus scrophulariae*, (85) *Anthrenus museorum*, (86) *Anthrenus fuscus*, (87) *Trogoderma variabile* (male), and (88) *Trogoderma sternale* (male). Abbreviation: cl, coxal line.



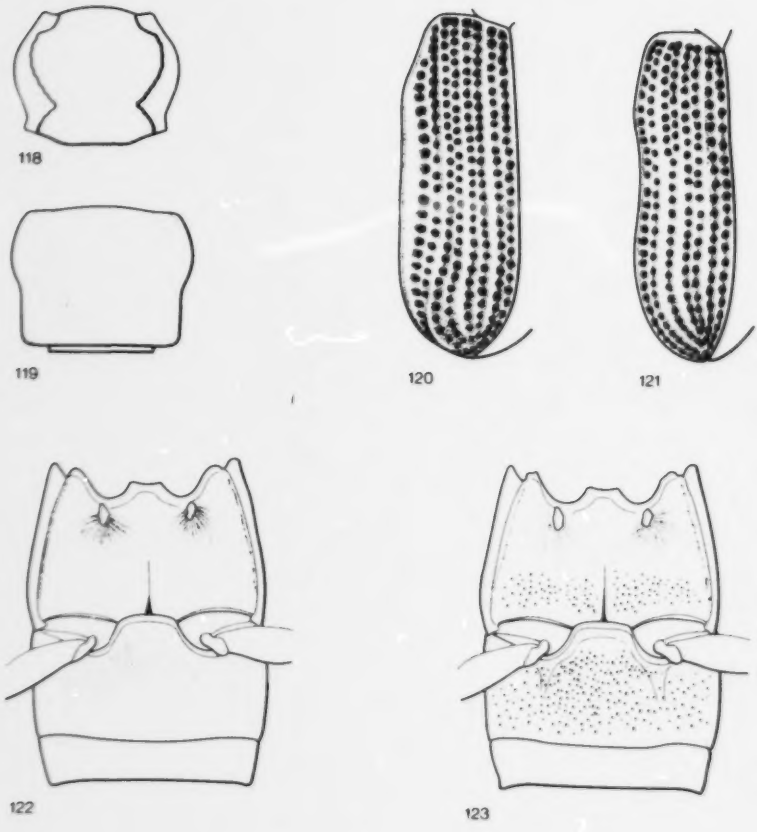
Figs. 89–98 Anterior half of body (ventral view) of (89) *Attagenus unicolor* and (90) *Trogoderma sternale*; head and pronotum of (91) *Megatoma variegata* and (92) *Attagenus unicolor*; left elytron of (93) *Anthrenus scrophulariae*, (94) *Anthrenus verbasci*, (95) *Trogoderma variabile*, and (96) *Trogoderma sternale*; elytral apex of (97) *Dermestes maculatus* and (98) *Dermestes lardarius*.
Abbreviation: ac, antennal cavity.



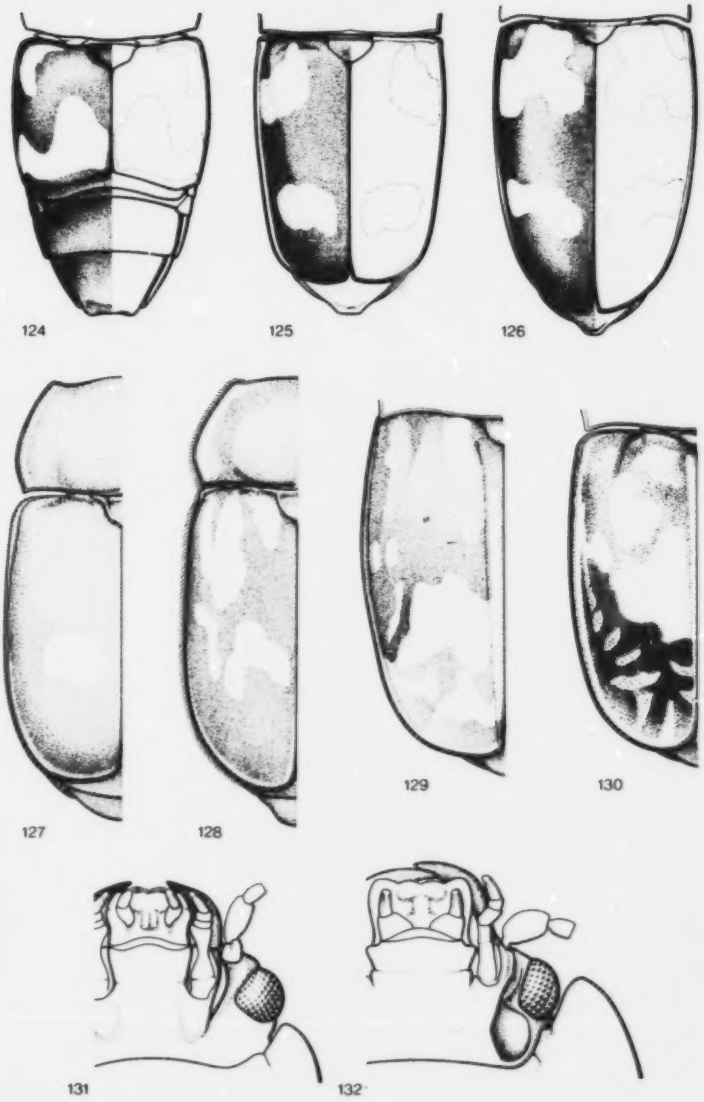
Figs. 99–108 Elytra of (99) *Corticaria pubescens*, (100) *Thes bergrothi*, and (101) *Dienerella filiformis*; abdomen (ventral view) of (102) *Melanophthalma distinguenda*, (103) *Corticarina* sp., and (104) *Corticaria pubescens*; hind tarsus of (105) *Corticarina* sp. and (106) *Corticaria pubescens*; antenna (dorsal view) of (107) *Dienerella filum* and (108) *Dienerella arga*.
Abbreviation: cl, coxal line.



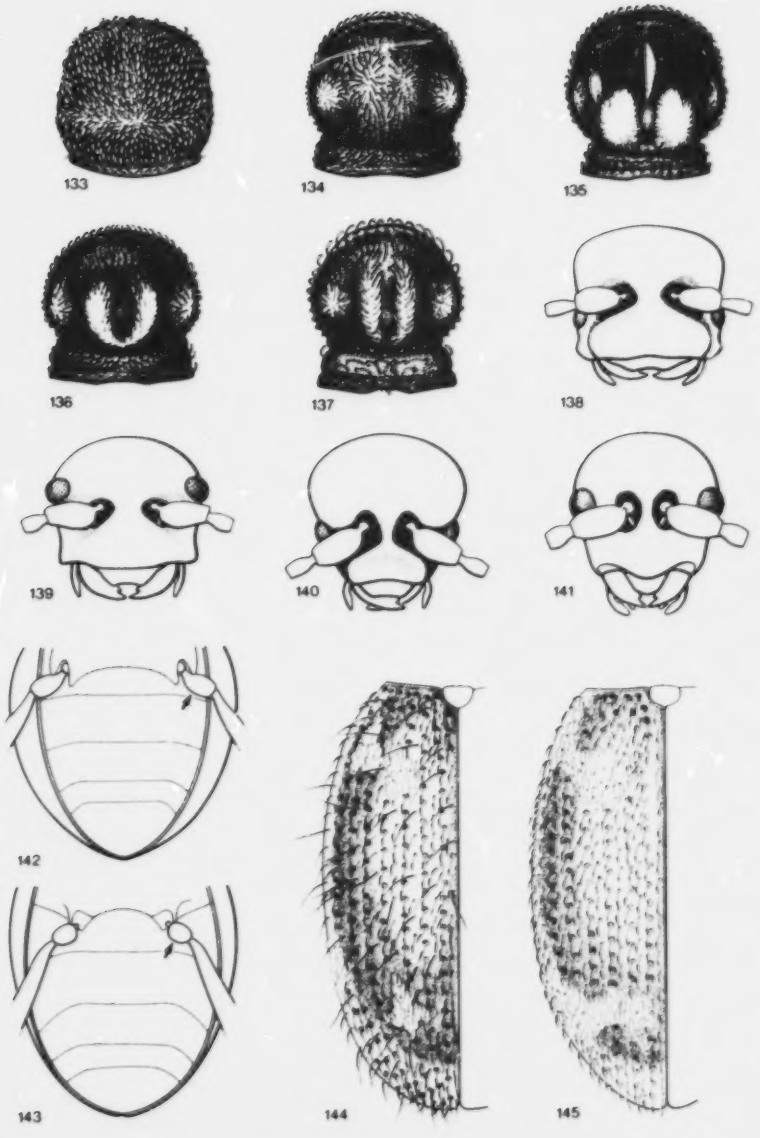
Figs. 109–117 Head and pronotum of (109) *Cartodere constricta* and (110) *Dienerella filum*; head (lateral view) of (111) *Lathridius minutus*, (112) *Dienerella arga*, and (113) *Dienerella costulata*; left elytron of (114) *Thes bergrothi*, and (115) *Lathridius minutus*. Pronotum of (116) *Lathridius minutus* and (117) *Enicmus mimus*. Abbreviations: ai, antennal insertion; te, temple.



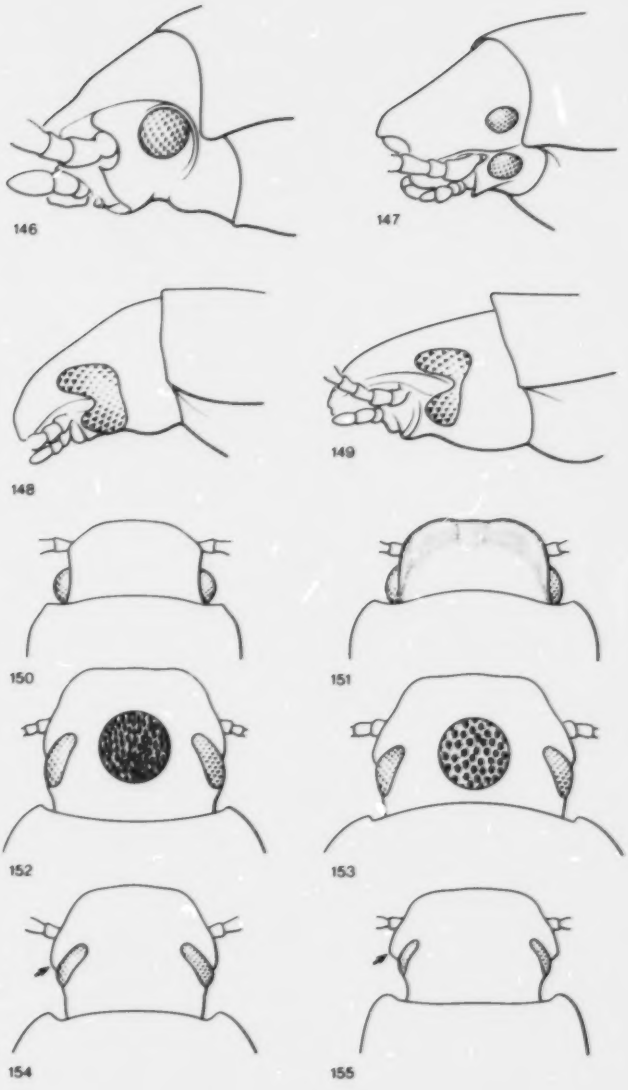
Figs. 118–123 Pronotum of (118) *Dienerella ruficollis* and (119) *Dienerella filiformis*; left elytron of (120) *Dienerella costulata* and (121) *Dienerella filiformis*; metathorax and first 2 abdominal sterna of (122) *Enicmus fictus* and (123) *Enicmus mimus*.



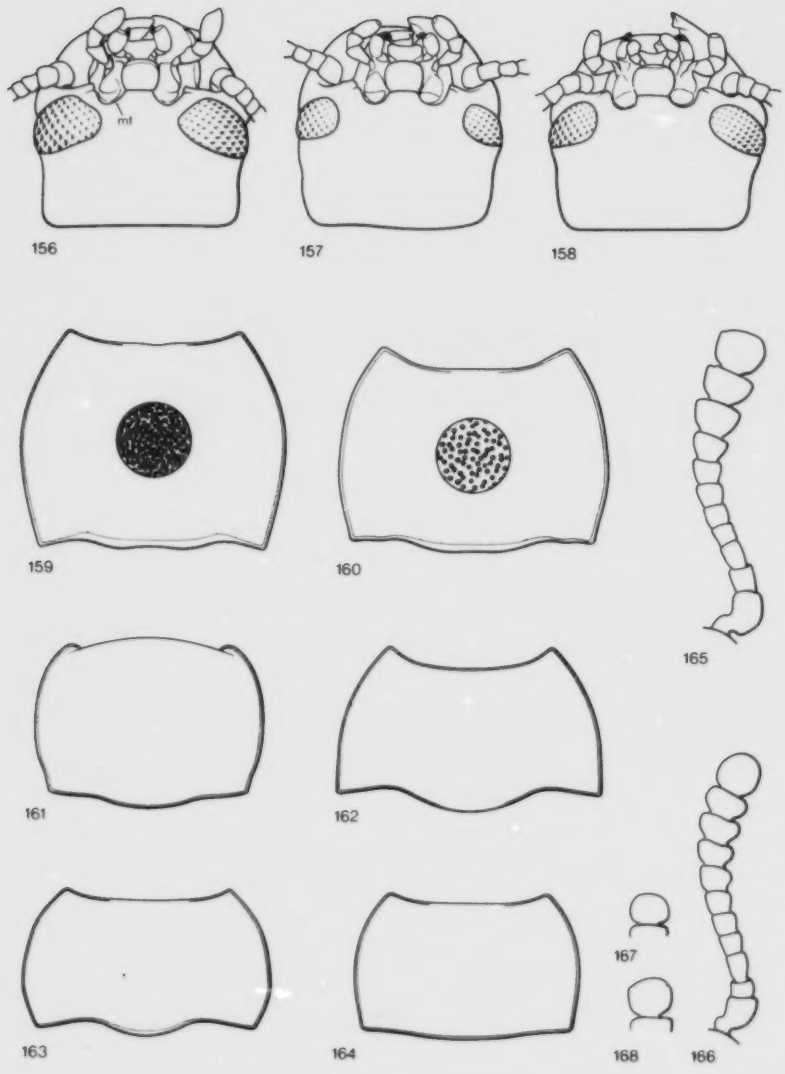
Figs. 124–132 Elytra and exposed abdominal terga of (124) *Carpophilus hemipterus*, (125) *Glischrochilus quadrisignatus*, and (126) *Glischrochilus fasciatus*; pronotum and elytra (left half) of (127) *Nitidula bipunctata* and (128) *Nitidula ziczac*; left elytron of (129) *Omosita colon* and (130) *Omosita discoidea*; head (left half, ventral view) of (131) *Nitidula ziczac* and (132) *Omosita colon*.



Figs. 133–145 Pronotum of (133) *Sphaericus gibboides*, (134) *Ptinus bicinctus*, (135) *Ptinus raptor*, (136) *Ptinus fur* (female), and (137) *Ptinus fur* (male); head (frontal view) of (138) *Niptus hololeucus*, (139) *Trigonogenius globulus*, (140) *Pseudeurostus hilleri*, and (141) *Ptinus ocellus*; abdomen and basal part of hind leg (ventral view) of (142) *Pseudeurostus hilleri* and (143) *Ptinus ocellus*; left elytron of (144) *Ptinus villiger* and (145) *Ptinus fur*.



Figs. 146–155 Head (lateral view) of (146) *Palorus ratzeburgii*, (147) *Blapstinus substriatus*, (148) *Tribolium castaneum*, and (149) *Tribolium confusum*; head (dorsal view) of (150) *Palorus ratzeburgii*, (151) *Palorus subdepressus*, (152) *Tribolium audax*, (153) *Tribolium madens*, (154) *Tribolium destructor*, and (155) *Tribolium confusum*.



Figs. 156–168 Head (ventral view) of (156) *Tribolium castaneum*, (157) *Tribolium audax*, and (158) *Tribolium madens*; pronotum of (159) *Tenebrio obscurus*, (160) *Tenebrio molitor*, (161) *Tribolium confusum*, (162) *Alphitobius diaperinus*, (163) *Alphitobius laevigatus*, and (164) *Cynaeus angustus*; antenna (dorsal view) of (165) *Tribolium audax* and (166) *Tribolium confusum*; last antennal segment of (167) *Tribolium castaneum* and (168) *Tribolium audax*.
Abbreviation: mf, maxillary fossa.

IDENTIFICATION PLATES

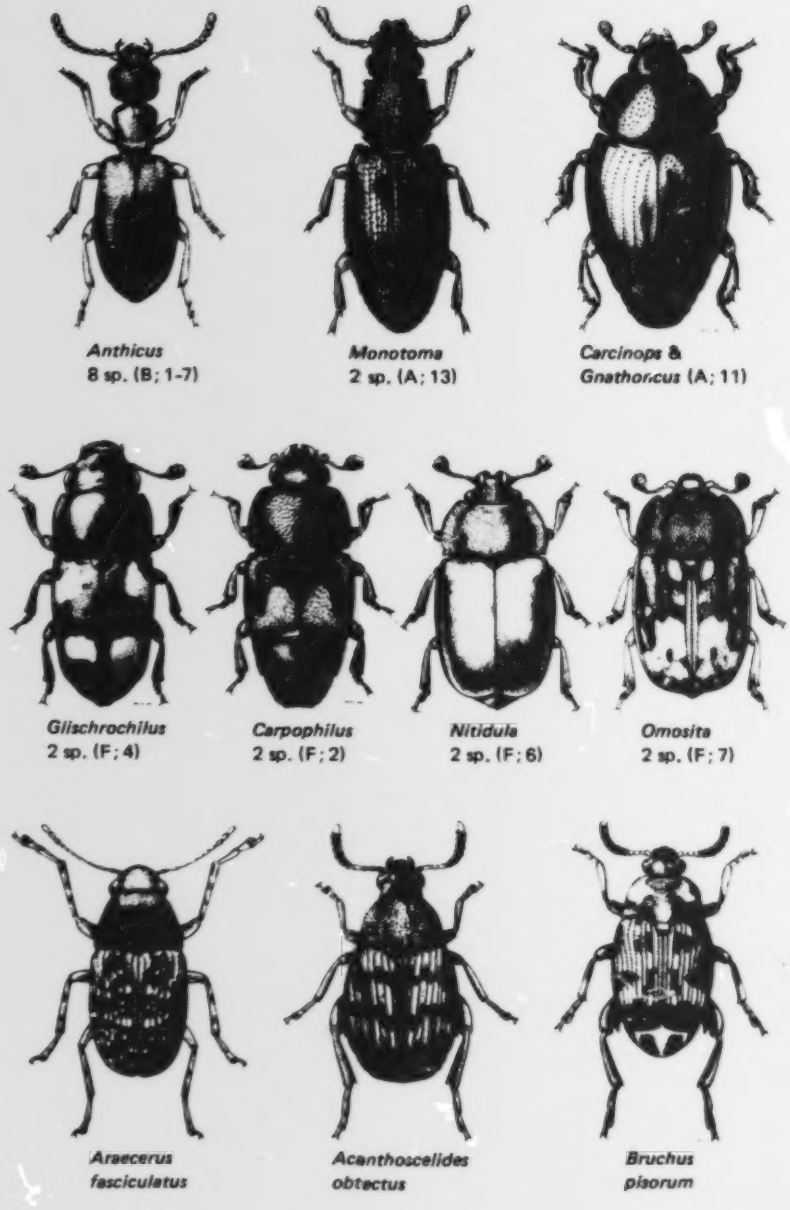


Fig. 169 Stored-product beetles with characteristic habitus (I). For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

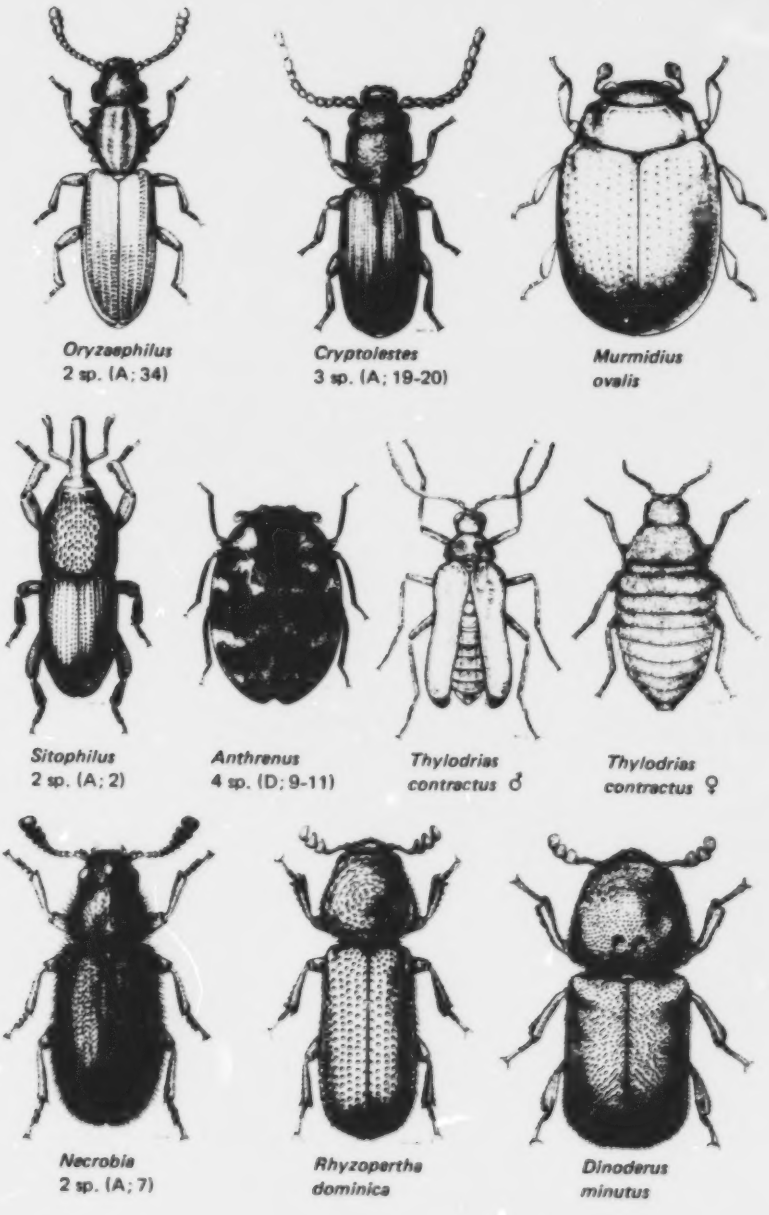


Fig. 170 Stored-product beetles with characteristic habitus (II). For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

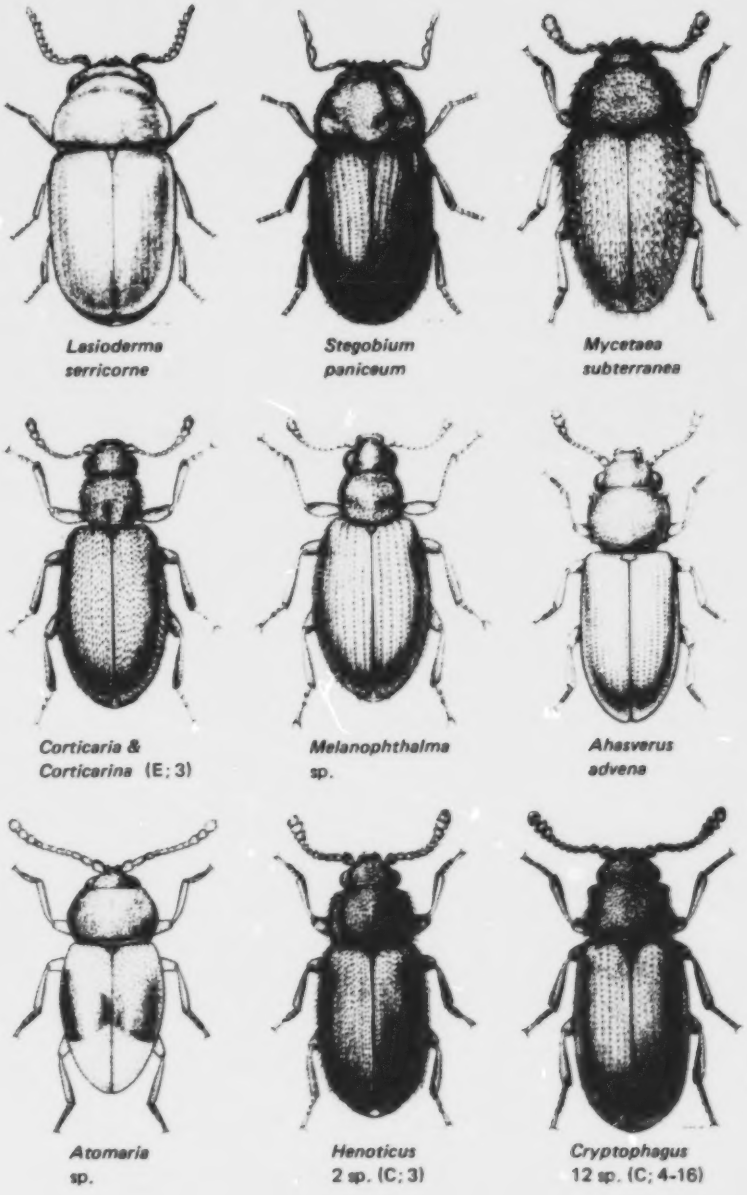


Fig. 171 Stored-product beetles with characteristic habitus (III). For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

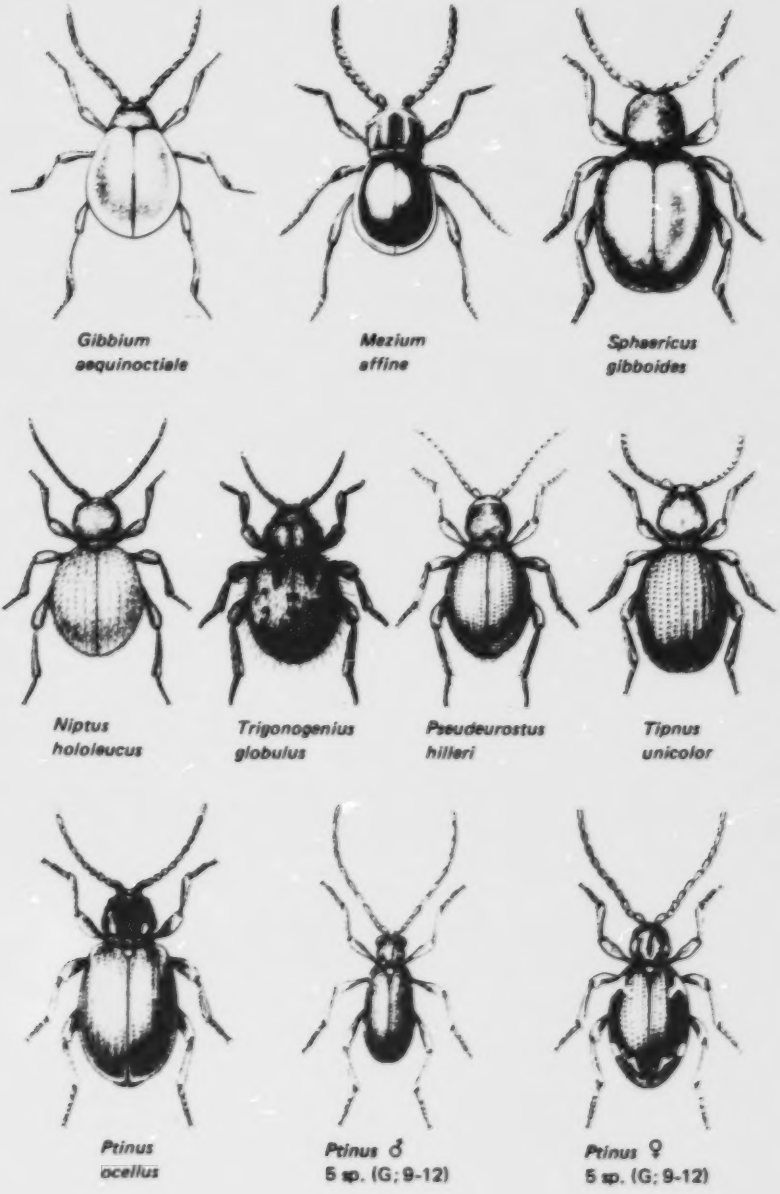
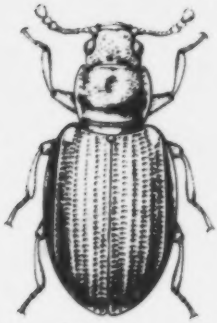


Fig. 172 Stored-product beetles with spider-like habitus. For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

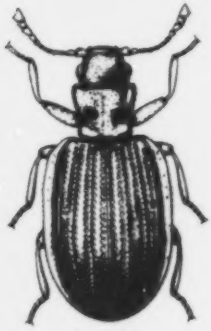
Aridius nodifer

Cartodere constricta

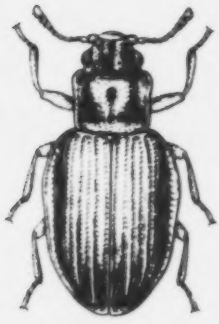
Dienerella
5 sp. (E; 5,11-13)



Enicmus
2 sp. (E; 10)



Lathridius minutus



Thes bergrothi

Fig. 173 Stored-product beetles of small size (1.2–2.4 mm) and without distinct pubescence. For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

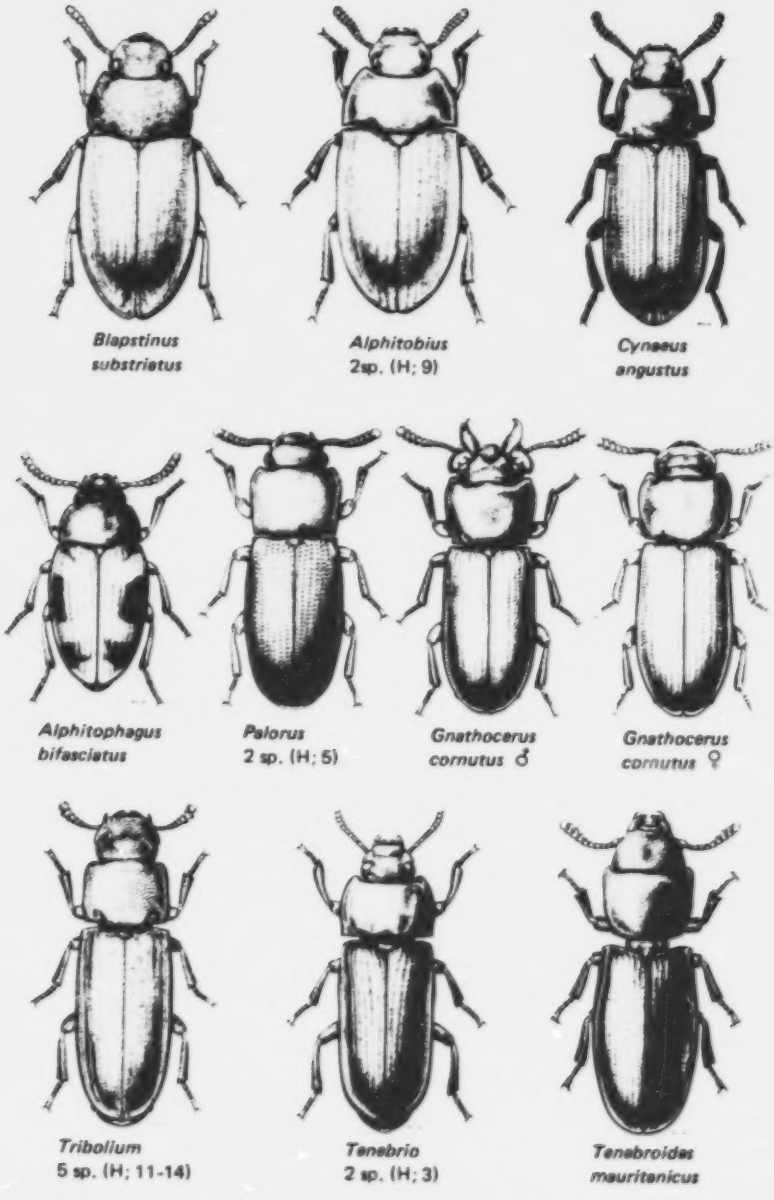


Fig. 174 Stored-product beetles of moderate or large size (2.2–17 mm) and without distinct pubescence. For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

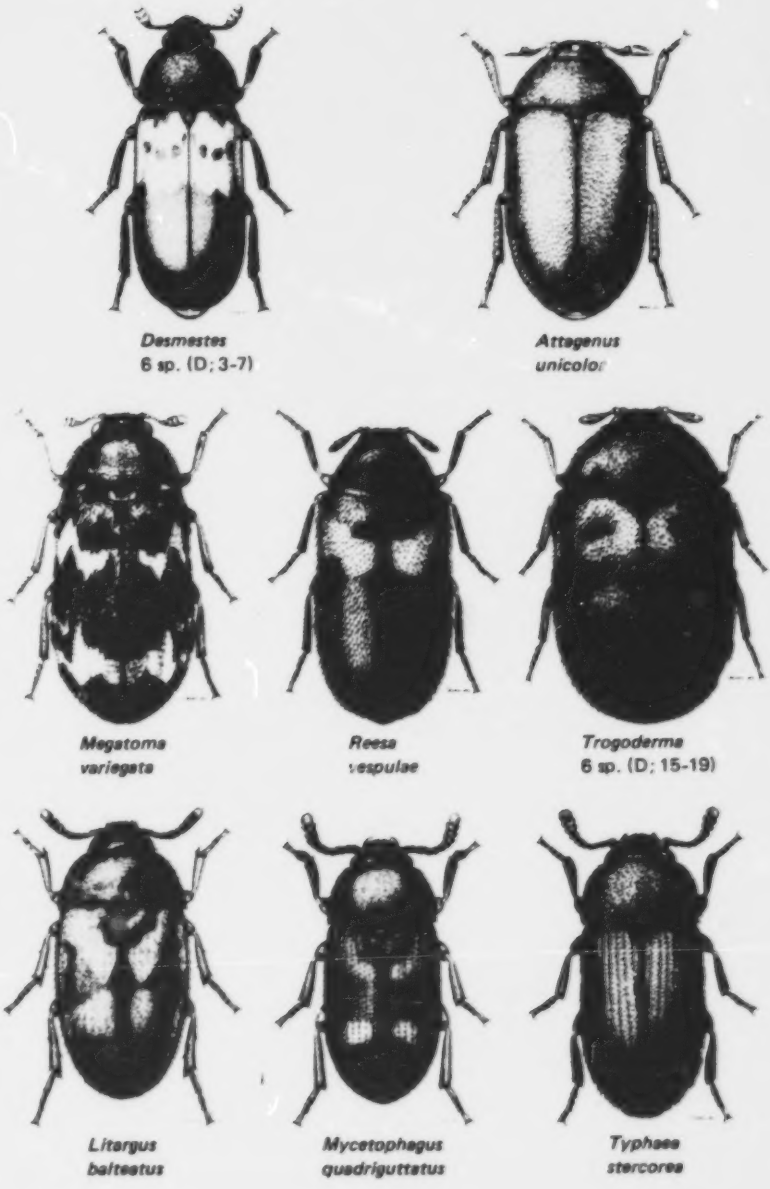


Fig. 175 Stored-product beetles with distinct pubescence. For genera with more than one species treated, the appropriate key and couplets for specific identification are indicated in parentheses.

GENERAL INFORMATION

This section contains information about the species either established or more or less regularly encountered in Canada and associated with stored products. In addition to the Latin name, the following data are provided for each species: common names (English and French) if available, diagnosis, sexual dimorphism, distribution, and economic importance. Synonyms used more or less regularly as valid names in the literature during the past few decades are included.

Common names are taken from Benoit (1985) except for a few English names already in use, which are not included by Benoit. The section entitled "Diagnosis" presents the most distinct characteristics, or the shortest combination of them, for the separation of the species. Some species are so distinctive that a reference to their general habitus is sufficient.

For some laboratory experiments using stored-product pests, it is often useful to sex the adults. Therefore, a section entitled "Sexual dimorphism" is included, giving the external sexual characters of the species. Whenever possible, the structural differences are illustrated with line drawings or scanning microscope photographs grouped at the end of the section (Figs. 241–269), or a reference to a paper illustrating the character is given. In some species, no external sexual differences were observed, and the sexes can be distinguished only by extracting the genitalia. More information about the subject is available in Halstead (1963*a*) and Faustini and Halstead (1982).

In the section entitled "Distribution," the world distribution and the Canadian distribution of the species are outlined. I use the word cosmopolitan for species found in all zoogeographical regions of the world as defined by Darlington (1957). The data on the Canadian distribution of the species are based on an examination of specimens preserved in the Canadian National Collection of Insects, Ottawa; the collection of the Winnipeg Research Station, Agriculture Canada; and a survey of the literature.

The economic status of the species is briefly described in the section entitled "Economic importance." Whenever possible, I have tried to emphasize the status of the species in Canada. Members of some groups, for instance anthicids, cryptophagids, and lathridiids, feed on other arthropods, residues, or fungi, and thus have no direct effect on the products. The economic status of these species is discussed in the comments provided for each family and is not repeated under each species.

Four genera—*Atomaria* of the family Cryptophagidae and *Corticaria*, *Corticarina*, and *Melanophthalma* of the family Lathridiidae—are included, but the species are not treated. This approach was necessary because the taxonomy of these genera needs revision, making it difficult to provide a name for the species. In these cases, instead of the information on sexual dimorphism and

distribution, the species most likely to be found in stored products in Canada are noted.

The species discussed here are grouped according to their family. Under each family, the reader will find brief comments and, at the end, a list of selected references on the taxonomy and the general biology of species of the group. It should be noted that the literature cited in the text is listed at the end of the publication.

The families and species are listed in alphabetical order of the Latin name.

In writing this section, I consulted a number of publications, particularly Lepesme (1945), Hinton (1945), Aitken (1975), Freeman (1980), Dobie et al. (1984), and Sinha and Watters (1985).

ANOBIIDAE death-watch beetles

This family, represented mainly in tropical areas of the world, includes about 70 species in Canada. The larvae of many species feed on dead wood, and some are regularly found in woodwork and structural wood of buildings; the most notable of these species in Canada is the furniture beetle, *Anobium punctatum* (De Geer). The larvae of some other species occur in fungi and in cones or twigs of conifers. The common name of these beetles is derived from the fact that the larvae of some species when burrowing produce a tapping sound by striking their mandibles against the walls of the tunnel; superstitious people interpreted the noise as a sign of impending death.

Two species of anobiids are associated with stored products and are among the most important pests.

Lasioderma serricorne (Fabricius)
cigarette beetle
lasioderme du tabac

Diagnosis: This small species differs from the other Coleoptera discussed in having the body pubescent, with the antennae distinctly serrate. It is distinct from *Stegobium paniceum*, the other anobiid associated with stored products in Canada, by its serrate antennae and the lack of striae on their elytra.

Sexual dimorphism: Males and females are externally similar.

Distribution: More or less cosmopolitan but characteristically more subtropical and tropical than temperate. In Canada the species occurs from coast to coast but can survive winter conditions only in heated buildings.

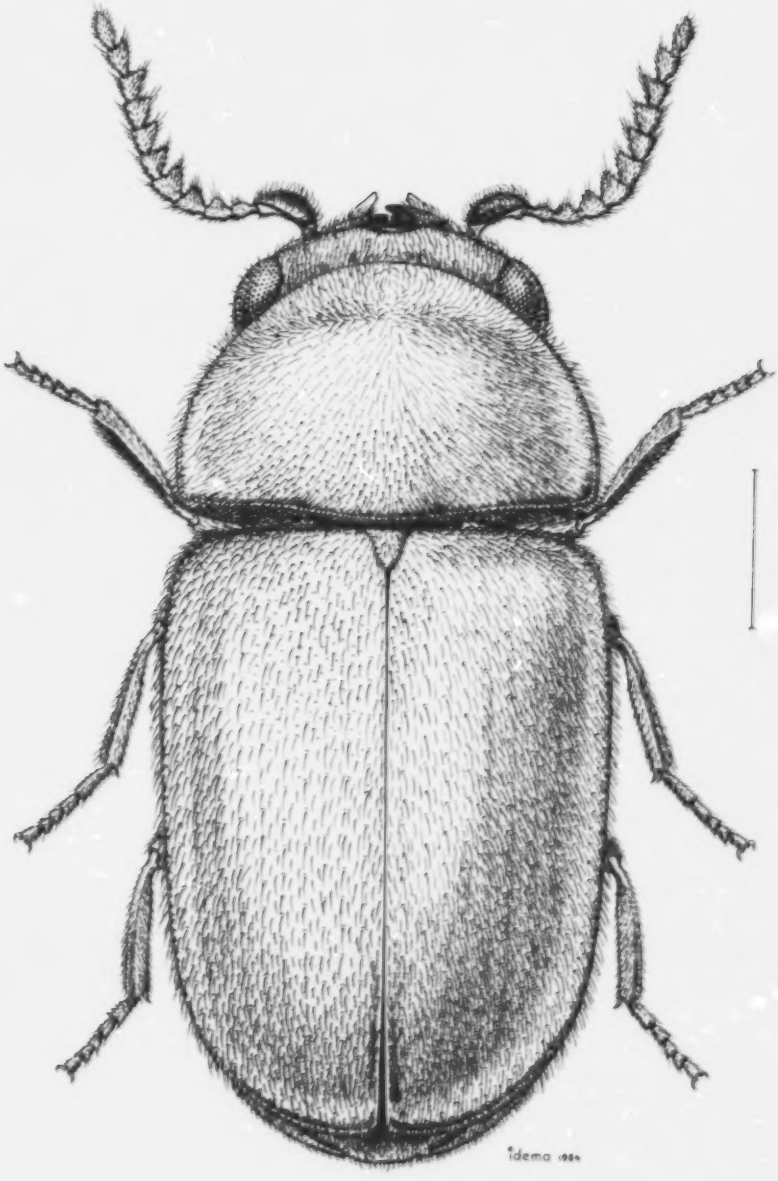


Fig. 176 *Lasioderma serricorne* (Fabricius). Scale = 0.5 mm.

Economic importance: This species is a well-known pest of stored tobacco, and infestations have been reported in Canadian tobacco-processing plants, warehouses, and stores. It also occurs in dwellings and stores, feeding on a wide variety of foods and drugs, and is known to attack dried insect and plant collections. According to Lefkovitch and Currie (1967), both adults and larvae feed on stored products, but the damage done by the larvae is more serious.

Stegobium paniceum (Linnaeus)
drugstore beetle
stégobie des pharmacies

Diagnosis: Because of its small size (length less than 3.5 mm) and general habitus (Fig. 177), *S. paniceum* can be confused only with *Lasioderma serricorne* and some ptinids, dermestids, and mycetophagids. The species is separated from *L. serricorne* by the shape of the antennae, which are not serrate but have a loose, 3-segmented club, and by the elytral striae marked by distinct punctures. It differs from the above-mentioned groups in having widely separated antennal insertions, 5-segmented tarsi, and no ocellus on the head.

Sexual dimorphism: Males have a slot-like structure on the tarsal claw; females have no such structure (Ward and Humphries 1977). This structure is distinct only on slide-mounted specimens.

Distribution: Cosmopolitan, but unlike the previous species, more characteristically temperate than tropical. The species occurs in Canada from coast to coast.

Economic importance: In Canada the species has been found regularly in mills, bakeries, warehouses, libraries, and houses, where the larvae feed on a wide variety of materials of vegetable and animal origin, including drugs that are poisonous to humans. They also attack dried plant collections, old books, and paper. Apparently, the adults do not feed.

Selected references

Farag, F.A.; Ismail, A.Y. 1986. Biological studies on the developmental stages of the cigarette beetle *Lasioderma serricorne* Fab. Iraqi J. Agr. Sci. 4:63–68.

Howe, R.W. 1957. A laboratory study of the cigarette beetle, *Lasioderma serricorne* (F.) (Col., Anobiidae) with a critical review of the literature on its biology. Bull. Entomol. Res. 48:9–56.

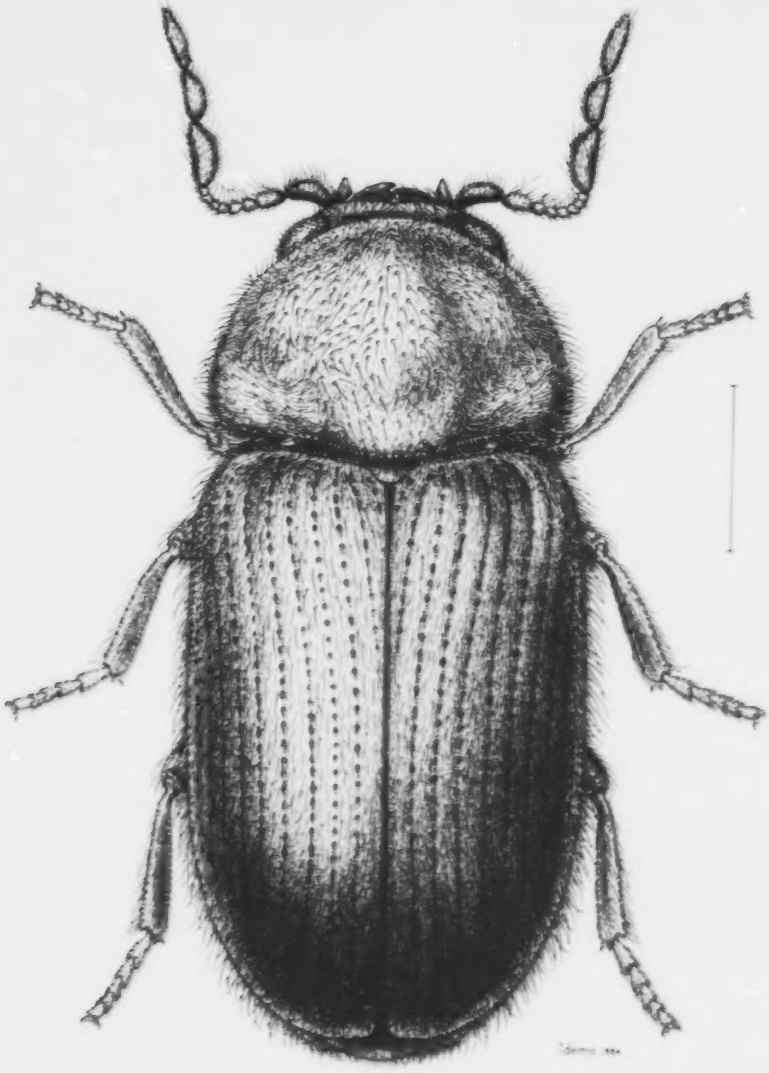


Fig. 177 ***Stegobium paniceum*** **(Linnaeus). Scale = 0.5 mm.**

Lefkovitch, L.P. 1967. A laboratory study of *Stegobium paniceum* (L.) (Coleoptera: Anobiidae). J. Stored Prod. Res. 3:235–249.

Lefkovitch, L.P.; Currie, J.E. 1967. Factors affecting adult survival and fecundity in *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae). J. Stored Prod. Res. 3:199–212.

ANTHICIDAE antlike flower beetles

This family, whose adults look superficially like ants, is represented by about 50 species in Canada. Their members are usually found under debris, stones, and leaf litter often near streams or lakes or on the flowers and foliage of trees and shrubs. The adults and larvae of many species are scavengers, feeding on decaying vegetation, molds, and dead insects; they also occasionally prey on small arthropods.

A few species of anthicids have been found associated with stored products, particularly grain in the Prairie Provinces, but they are of little economic importance as pests. They do not feed directly on grain kernels and seem to be confined mainly to residues. Most previous stored-product records of anthicids in Canada refer to *Anthicus floralis*. Since the adults of this species are superficially similar to those of many other *Anthicus*, some earlier records probably represent misidentifications.

Anthicus cervinus LaFerté-Sénectère

Diagnosis: Among the species of *Anthicus* dealt with here, *A. cervinus* is distinctive in having the pubescence on the basal half of the elytra (except along the suture) markedly curved and very trim, the apices of the setae being curved below the horizontal.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Exclusively North American. In Canada the species is known from Quebec west to British Columbia.

Economic importance: As mentioned for the family.

Anthicus ephippium LaFerté-Sénectère

Diagnosis: This species and *A. scabriceps* differ from the other anthicids discussed here in having the prosternum covered anteriorly

with dense pubescence. Adults of this species are easily separated from those of *A. scabriceps* in having the pronotum smooth, without small longitudinal ridges between the punctures.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Exclusively North American. The species is known in Canada from Ontario west to British Columbia.

Economic importance: As stated for the family.

Anthicus flavicans LeConte

Diagnosis: The species is distinctive among anthicids included here in having short longitudinal ridges between the punctures on the pronotum.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Exclusively North American. In Canada the species has been reported in Nova Scotia, Quebec west to British Columbia, and the Northwest Territories.

Economic importance: As discussed for the family.

Anthicus floralis (Linnaeus)[7]
narrownecked grain beetle

Diagnosis: The species is distinctive among the North American species of *Anthicus* in having the mesosternum broadly expanded, with the lateral margins fringed with setae appressed to the mesepisternum. Otherwise, the adults are quite similar to *A. formicarius* except that they have a pair of small median protuberances on the anterior fourth.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Cosmopolitan. In Canada the species has been found from Quebec west to British Columbia.

[7] In the European literature, *A. floralis* and *A. formicarius* are usually placed in the genus *Omonadus* Mulsant & Rey.

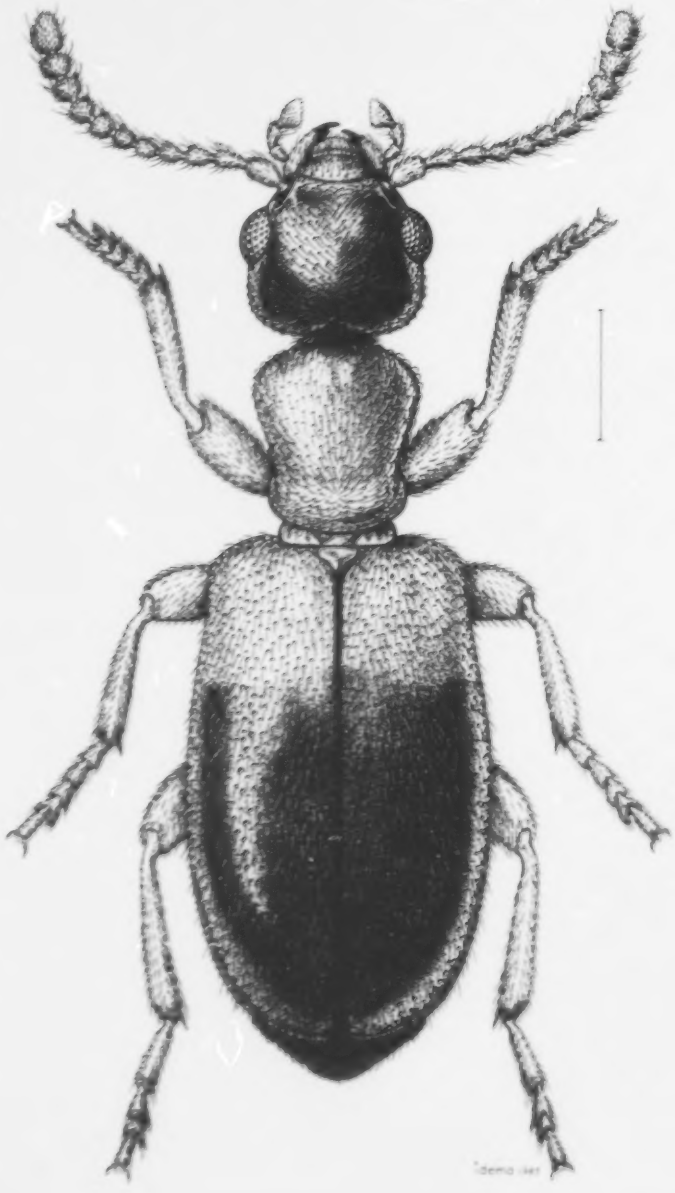


Fig. 178 *Anthicus floralis* (Linnaeus). Scale = 0.5 mm.

Economic importance: As mentioned for the family. This species is the world's most commonly reported anthicid associated with stored products.

Anthicus formicarius (Goeze)[8]

Diagnosis: The species is similar to *A. floralis* but differs in that it has no median protuberances on the pronotum and has the mesosternum with the lateral margins almost straight and lacking a fringe of appressed setae. This species has very short setae on the dorsum of the body, as in *A. floralis*.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Cosmopolitan, but apparently less abundant than *A. floralis* (Werner 1964). In Canada the species is known from Quebec west to British Columbia.

Economic importance: As discussed for the family.

Anthicus hastatus Casey

Diagnosis: The species differs from the other *Anthicus* dealt with here by the combination of having the surface of the head and pronotum smooth between the punctures, the prosternum without dense pubescence anteriorly, and the elytral pubescence long, suberect, and at most slightly curved.

Sexual dimorphism: Males have 2 exposed abdominal terga (as in Fig. 255) and a spine-like prolongation on the posterior margin of the hind trochanter; females have only 1 exposed tergum (as in Fig. 255) and lack the spine-like prolongation of the hind trochanter.

Distribution: Exclusively North American. In Canada the species is known from Manitoba west to British Columbia.

Economic importance: As stated for the family.

[8] In the European literature, *A. floralis* and *A. formicarius* are usually placed in the genus *Omonadus* Mulsant & Rey.

Anthicus punctulatus LeConte

Diagnosis: The species is distinctive among the anthicids discussed here by the uniform coloration of the elytral integument, which varies from brown to (usually) black. In the other species the integument is either entirely pale (usually yellowish) or more commonly bicolorous. When the integument is bicolorous, the elytra may be piceous to black, with a pair of pale spots behind the middle.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Exclusively North American. In Canada the species is known from specimens collected in British Columbia and from a few found in Manitoba, Saskatchewan, and Alberta.

Economic importance: As stated for the family.

Anthicus scabriceps LeConte

Diagnosis: The species differs from all other North American *Anthicus* in having small tubercles between the punctures on the dorsum of the head (except medially) and the pronotum.

Sexual dimorphism: Males have 2 exposed abdominal terga, females only 1 (as in Fig. 255).

Distribution: Exclusively North American. The species occurs in Canada from Newfoundland west to Alberta.

Economic importance: As discussed for the family.

Selected reference

Werner, F.G. 1964. A revision of the North American species of *Anthicus*, s.str. (Coleoptera: Anthicidae). Misc. Publ. Entomol. Soc. Am. 4:195–242.

ANTHRIBIDAE fungus weevils

This family is well represented in the tropical regions and includes only about 20 species in Canada. The adults are usually found on trees and fungi; larvae occur in twigs and branches of trees, in hard or polyporous fungi, and under the bark of dying or dead trees. The

adults feed on pollen, fungi, or dead wood; the larvae eat vegetable matter.

Only one species, *Araecerus fasciculatus*, is of economic importance in stored products.

Araecerus fasciculatus (De Geer)
coffee bean weevil

Diagnosis: Because of its distinct general habitus (Fig. 179), *A. fasciculatus* can be confused only with the species of bruchids dealt with in this guide. It differs, however, in having an antennal club, the eye entire, and the elytra without distinct striation.

Sexual dimorphism: Males have the last exposed tergum vertical and therefore barely distinct from above; females have that tergum inclined and distinct from above (Fig. 241).

Distribution: Abundant in subtropical and tropical regions, irregularly found in temperate areas. In Canada the species has been intercepted at various locations in Ontario and British Columbia. It is not established in Canada, but some records suggest that it can maintain itself for some time in warehouses and food-processing plants.

Economic importance: This species is known mainly as a serious pest of coffee and cocoa beans stored for some time. It is also found, though less frequently, on various other stored grains, seeds, and foodstuffs. The damage is done primarily by the larvae. As far as is known, the species is of little economic importance in the temperate regions (Munro 1966).

Selected references

El Sayed, M.T. 1935. On the biology of *Araecerus fasciculatus* De Geer (Col., Anthribidae), with special reference to the effects of variations in the nature and water content of the food. Ann. Appl. Biol. 22:557–577.

El Sayed, M.T. 1940. The morphology, anatomy and biology of *Araecerus fasciculatus* De Geer (Coleoptera: Anthribidae). Bull. Soc. Fouad 1er Entomol. 24:82–151.

Mphuru, A.N. 1974. *Araecerus fasciculatus* de Geer (Coleoptera: Anthribidae): A review. Trop. Stored Prod. Inf. 26:7–15.

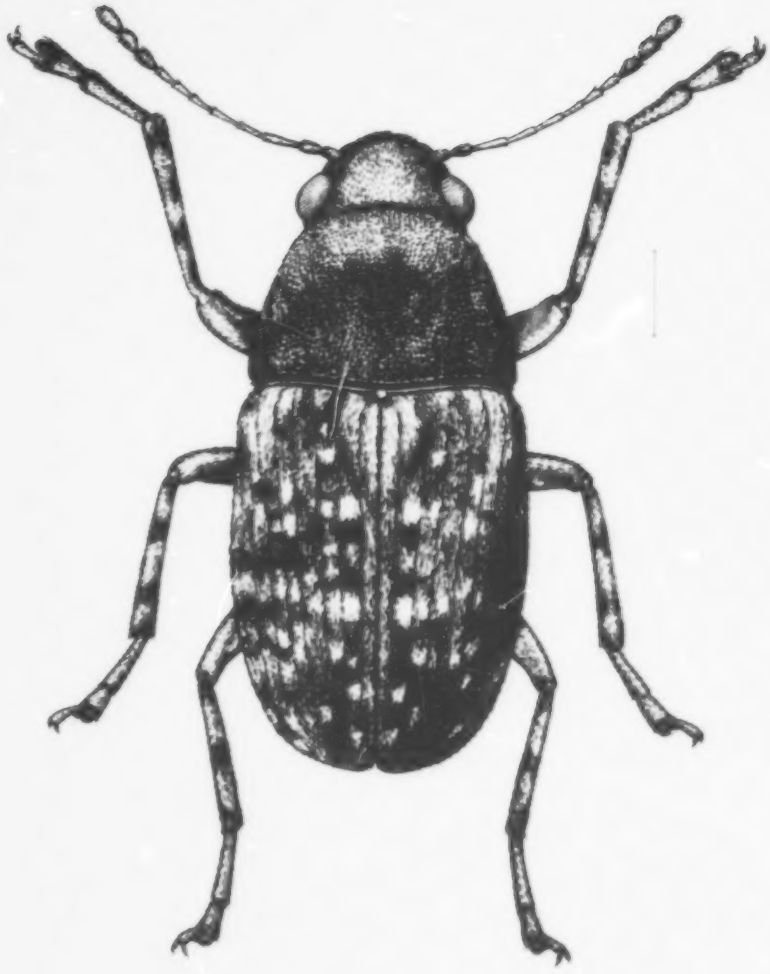


Fig. 179 *Araecerus fasciculatus* (De Geer). Scale = 0.5 mm.

BOSTRICHIDAE branch-and-twig borers

This family is represented mainly in subtropical and tropical regions of the world. Relatively few species occur in temperate regions, and only about 20 are currently known in Canada. Larvae of bostrichids are wood borers.

Some bostrichids are serious pests of trees and felled timber. A few, including *Prostephanus truncatus* (Horn), *Rhyzopertha dominica* (Fabricius), and *Dinoderus minutus* (Fabricius), are associated with stored products. The last two species mentioned are reported here, although they are not established in Canada. These bostrichids differ from the other Coleoptera dealt with here by the presence of rasp-like teeth on the pronotum.

Dinoderus minutus (Fabricius)
bamboo powderpost beetle

Diagnosis: The species differs from *Rhyzopertha dominica*, the other bostrichid included here, by its stout body, by the elytral setae straight, and by a pair of shallow, medial depressions near the base of the pronotum.

Sexual dimorphism: Sexes are externally similar.

Distribution: Widely distributed in the tropics; occasional in heated premises in temperate regions. In Canada the species has been reported in Ontario, Manitoba, Saskatchewan, and British Columbia.

Economic importance: The species is primarily a pest of bamboo and cane but has been reported boring into other wood or infesting dried vegetable materials such as stored grain, tobacco, and fruit. In Canada *D. minutus* is found occasionally in warehouses and houses where bamboo products are stored.

Rhyzopertha dominica (Fabricius)
lesser grain borer
petit perceur des céréales

Diagnosis: The species is easily separated from *D. minutus* in being more elongate, in having the elytral setae curved, and in having no depressions near the base of the pronotum.

Sexual dimorphism: Males usually have the last exposed abdominal tergum uniformly brown (Stemly and Wilbur 1966) and a shallow groove, entire or somewhat broken, on each side of the fifth visible

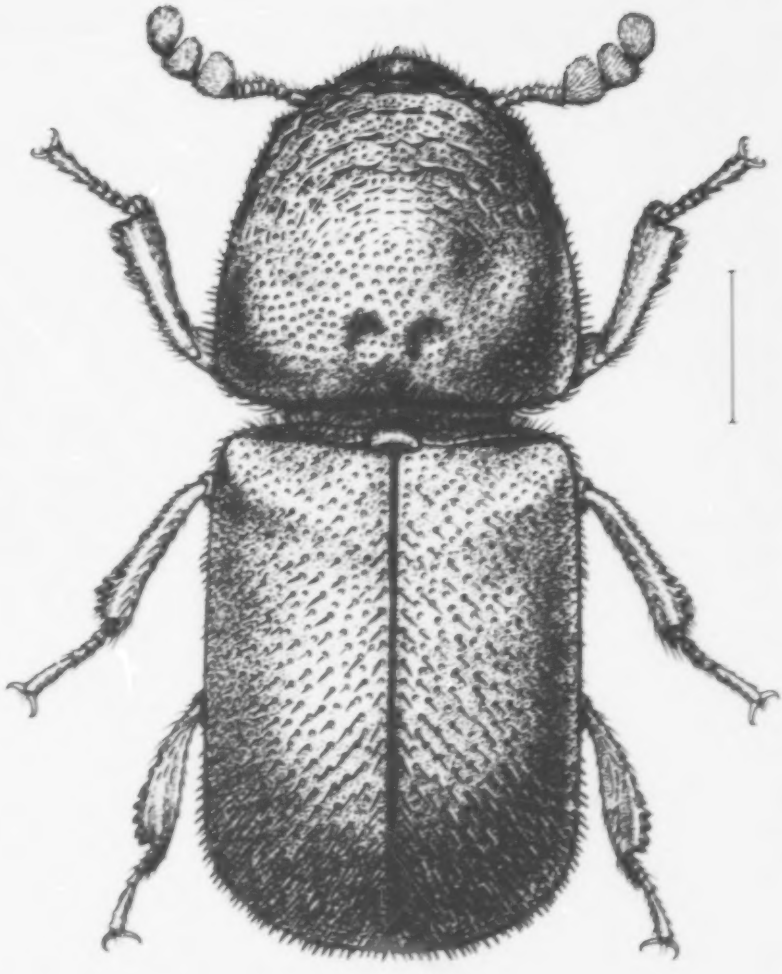


Fig. 180 *Dinoderus minutus* (Fabricius). Scale = 0.5 mm.

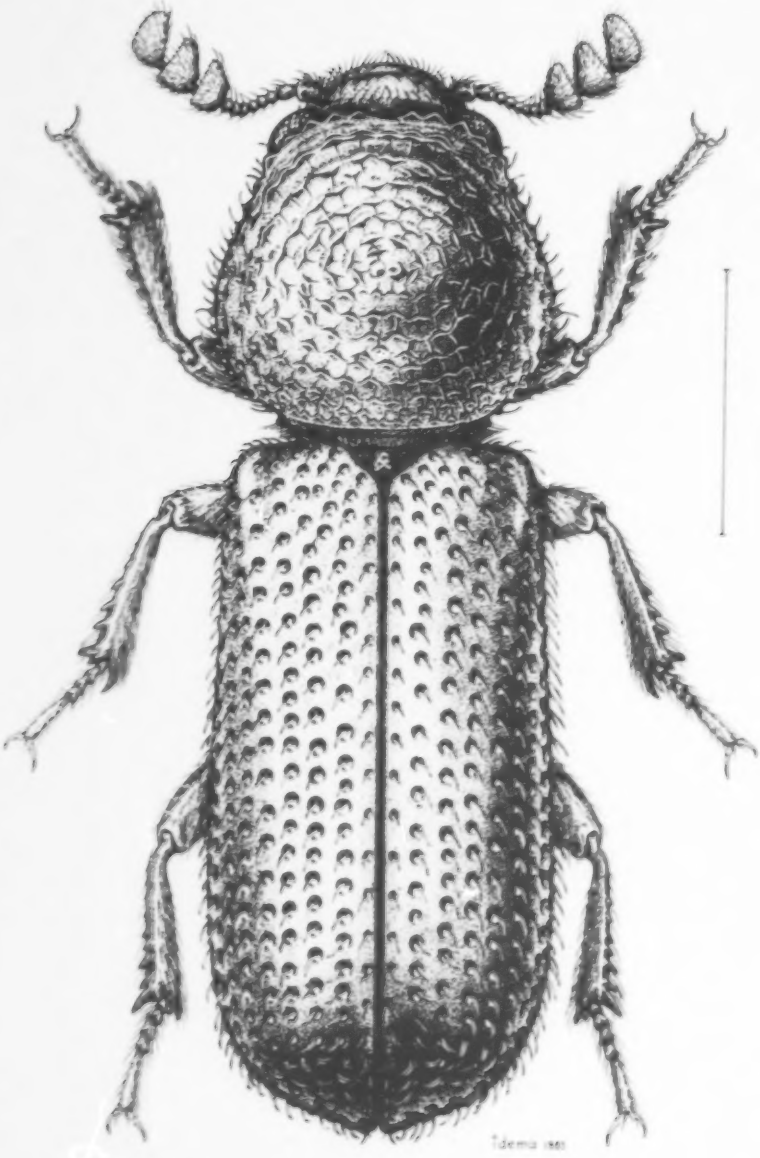


Fig. 181 ***Rhyzopertha dominica*** **(Fabricius). Scale = 0.5 mm.**

abdominal sternum (Ghorpade and Thyagarajan 1980); occasionally, the groove may be missing on one side of the sternum. In females the last exposed tergum is usually pale yellow, and the fifth visible abdominal sternum is more convex laterally and without a groove. Sinclair (1981) discussed the reliability of both characters.

Distribution: Throughout the warm regions of the world, mainly confined to heated buildings in the temperate regions. In Canada the species has been reported in Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia.

Economic importance: This species is well known as a pest of stored grain in all warm regions of the world. It also occurs on a wide variety of food, particularly cereals. The damage is done by both adults and larvae. *Rhyzopertha dominica* is not a serious pest in Canada, even though it is intercepted regularly at ports in imported grain and is found occasionally in food-processing plants and mills, where it can survive for some time. The species may eventually become established in this country; Storey et al. (1983) reported that its distribution in the United States has expanded in recent decades throughout the grain-producing areas to include even the northernmost states bordering Canada.

Selected references

Howe, R.W. 1950. The development of *Rhizopertha dominica* (F.) (Col., Bostrichidae) under constant conditions. Entomol. Mon. Mag. 86:1–5.

Kingsolver, J.M. 1971. A key to the genera and species of Bostrichidae commonly intercepted in USDA Plant Quarantine Inspection. U.S. Department of Agriculture, Agricultural Quarantine Inspection Memorandum, No. 697. 11 pp.

Potter, C. 1935. The biology and distribution of *Rhizopertha dominica* (Fab.). Trans. R. Entomol. Soc. Lond. 83:449–482.

Spilman, T.J. 1982. False powderpost beetles of the genus *Dinoderus* in North America (Coleoptera, Bostrichidae). Coleopt. Bull. 36:193–196.

BRUCHIDAE seed beetles

In Canada the bruchids are represented by about 20 species. The adults are found on flowers and foliage. The larvae eat the seeds of various plants, mainly Leguminosae. Since they feed inside the seed, infestations are usually not apparent until the adults emerge.

Most species of this family are field pests, infesting ripening pods or the exposed seeds of growing plants. Adults of some of these species may emerge from seeds in stores but are unable to reinfest dried seeds; they have to gain access to ripening pods in the field to reproduce. A few species, however, are associated with stored products. In such cases the adults can reinfest dried seeds and produce successive generations.

Besides the species included here, two species of *Callosobruchus*, *C. chinensis* (Linnaeus) and *C. maculatus* (Fabricius), are found occasionally in imported beans in Canada. These *Callosobruchus* species differ from *Acanthoscelides obtectus* and *Bruchus pisorum* in having a distinct tooth on both the upper and lower margins of the hind femur.

Acanthoscelides obtectus (Say)
bean weevil
bruche du haricot

Diagnosis: The species is easily differentiated from *Bruchus pisorum*, the other bruchid included here, by its smaller size and in having a large tooth, followed by 3–4 smaller teeth, on the lower margin of the hind femur and no tooth on the upper margin.

Sexual dimorphism: Males have the last exposed abdominal sternum emarginate, its length being shorter than the length of the previous sternum at the middle; females have the last sternum submarginate, the length at the middle being as long as that of the previous sternum (Fig. 242).

Distribution: Cosmopolitan. In Canada the species has been found from Nova Scotia west to British Columbia but can survive winter conditions only in a heated environment.

Economic importance: The species is a well-known pest of beans, particularly those of the genera *Phaseolus* and *Vigna*. In Canada it is found mainly in association with stored beans, although infestations of growing crops have been reported (Campbell et al. 1989). The damage is done by the larvae, which feed inside the beans.

Bruchus pisorum (Linnaeus)
pea weevil
bruche du pois

Diagnosis: The species differs from *Acanthoscelides obtectus*, the other economically important bruchid in Canada, by its larger size and in having a large tooth on the upper margin of the hind femur and usually a small tooth on the lower margin.

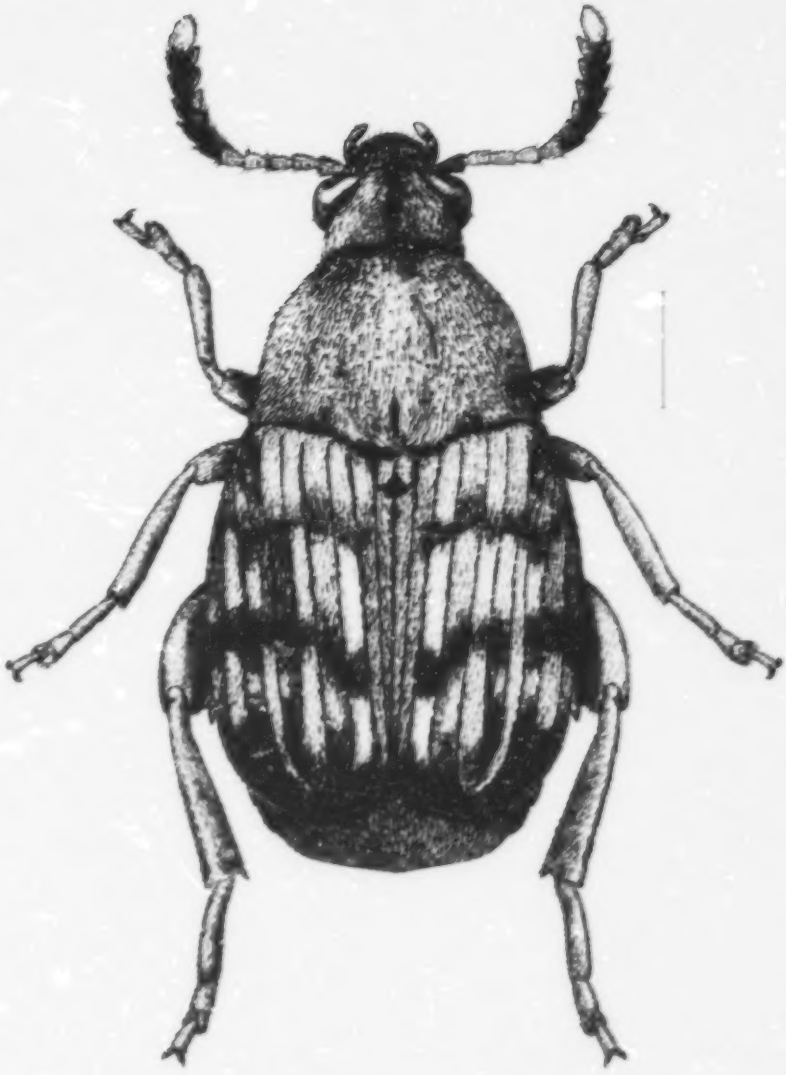


Fig. 182 *Acanthoscelides obtectus* (Say). Scale = 0.5 mm.

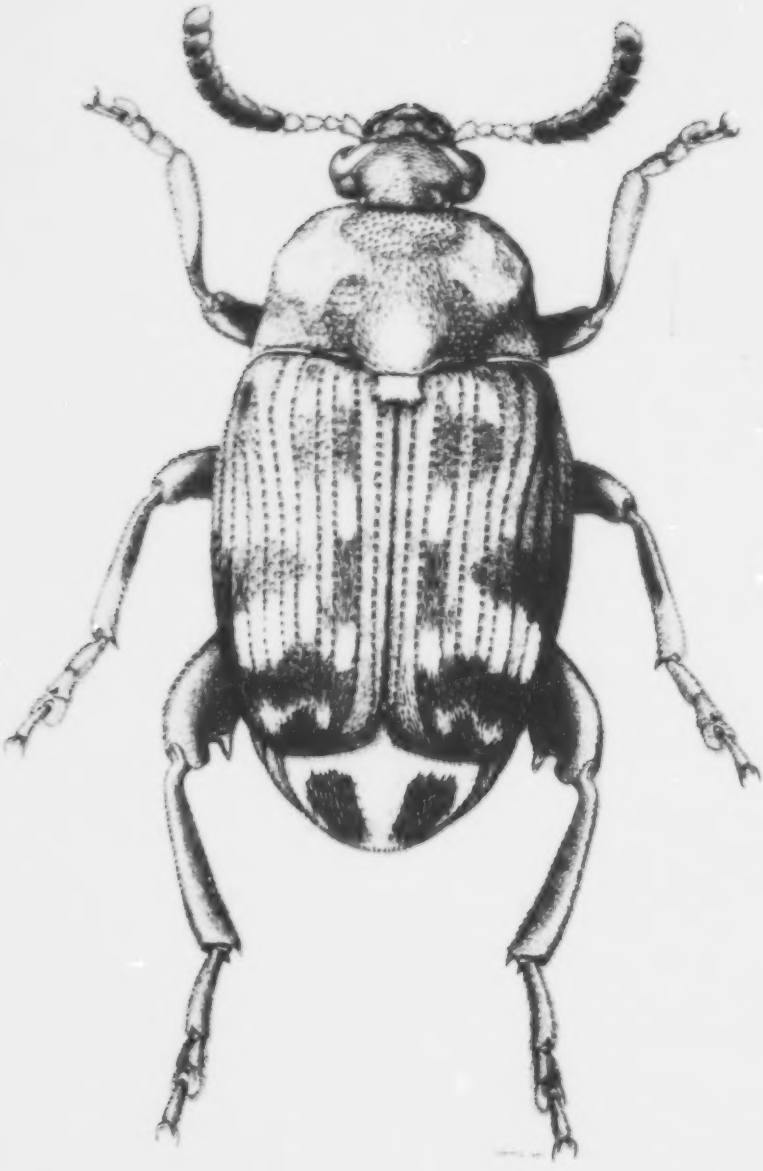


Fig. 183 *Bruchus pisorum* (Linnaeus). Scale = 0.5 mm.

Sexual dimorphism: Males have a spine-like projection at the apex of the median tibia; females lack such projection (Fig. 243).

Distribution: Cosmopolitan. The species occurs from coast to coast in Canada.

Economic importance: This species is a well-known pest of the cultivated pea. However, it appears to be of little importance in Canada, though in the past it was responsible for great losses in Ontario, causing many farmers to stop growing peas (Ceasar 1938; Goble 1960). This bruchid, like many others, is unable to reproduce indoors, and the females must migrate from storage buildings to the pea fields to lay their eggs. It is included in this guide because the adults are found regularly in storage places after they emerge from the harvested peas.

Selected references

Southgate, B.J. 1978. The importance of the Bruchidae as pests of grain legumes, their distribution & control. Pages 219–229 *in* Singh, S.R.; van Emden, H.F.; Ajibola Taylor, T., eds. Pests of grain legumes: Ecology and control. Academic Press, London. 454 pp.

Southgate, B.J. 1979. Biology of the Bruchidae. Annu. Rev. Entomol. 24:449–473.

CARABIDAE ground beetles

About 850 species of this large family are currently known in Canada. Adults and larvae are found in most terrestrial habitats and wetlands such as marshes and bogs. Members of most species are carnivorous, preying on small arthropods, slugs, and snails; members of some species are phytophagous.

Carabids are incidental in stored products and are of no economic importance as pests.

CERYLONIDAE cerylonid beetles

This family of small beetles includes six species in Canada. Members are most commonly found under bark and in forest litter. Little is known about the bionomics of these species, but they apparently feed on fungi.

One species of Cerylonidae occurring in North America is sometimes associated with stored products.

Murmidius ovalis (Beck)

Diagnosis: The species differs readily from the other Coleoptera dealt with here by its general habitus (Fig. 184), particularly the presence of an antennal cavity on the anterolateral margin of the pronotum.

Sexual dimorphism: Sexes are externally similar.

Distribution: Probably cosmopolitan. In Canada the species has been recorded only in southern Ontario.

Economic importance: The species is reported occasionally in stored products in North America. It does not damage the products directly, as the adults and larvae probably feed on molds and yeasts. Most specimens have been collected in Canada from feed mills.

Selected reference

Halstead, D.G.H. 1968. Observations on the biology of *Murmidius ovalis* (Beck) (Coleoptera: Cerylonidae). J. Stored Prod. Res. 4:13–21.

CLERIDAE checkered beetles

About 40 species of clerids occur in Canada. The adults are usually found on foliage, flowers, and the bark of dying trees. Adults and larvae of this family are mainly predacious, and many species are known to prey on wood-boring beetles of the families Scolytidae, Buprestidae, and Cerambycidae. In some species the adults feed on pollen, and the larvae are scavengers.

Very few clerids are associated with stored products. Two of them are found in Canada. A third one, *Necrobia ruficollis* (Fabricius), has been intercepted occasionally at ports of entry, in imported products. Adults of *N. ruficollis* differ from those of the two clerids dealt with here in having the pronotum and base of the elytra reddish yellow with the rest of the elytra metallic blue or green. In the two species treated below, the dorsum of the body is uniformly metallic blue or green.

Necrobia rufipes (De Geer)
redlegged ham beetle
nécrobie à pattes rousses

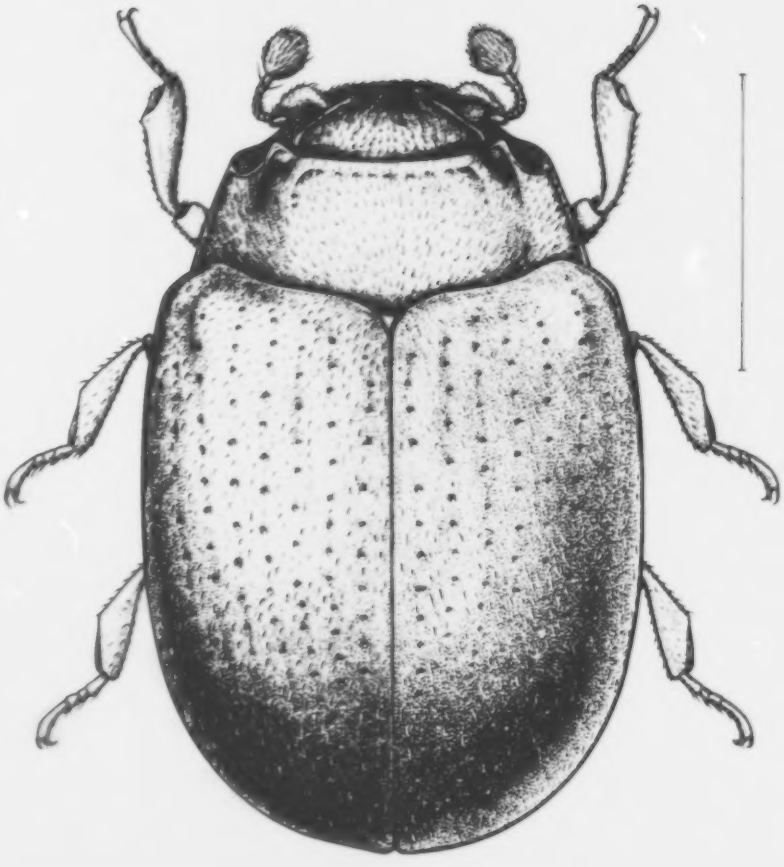


Fig. 184 *Murmidius ovalis* (Beck). Scale = 0.5 mm.

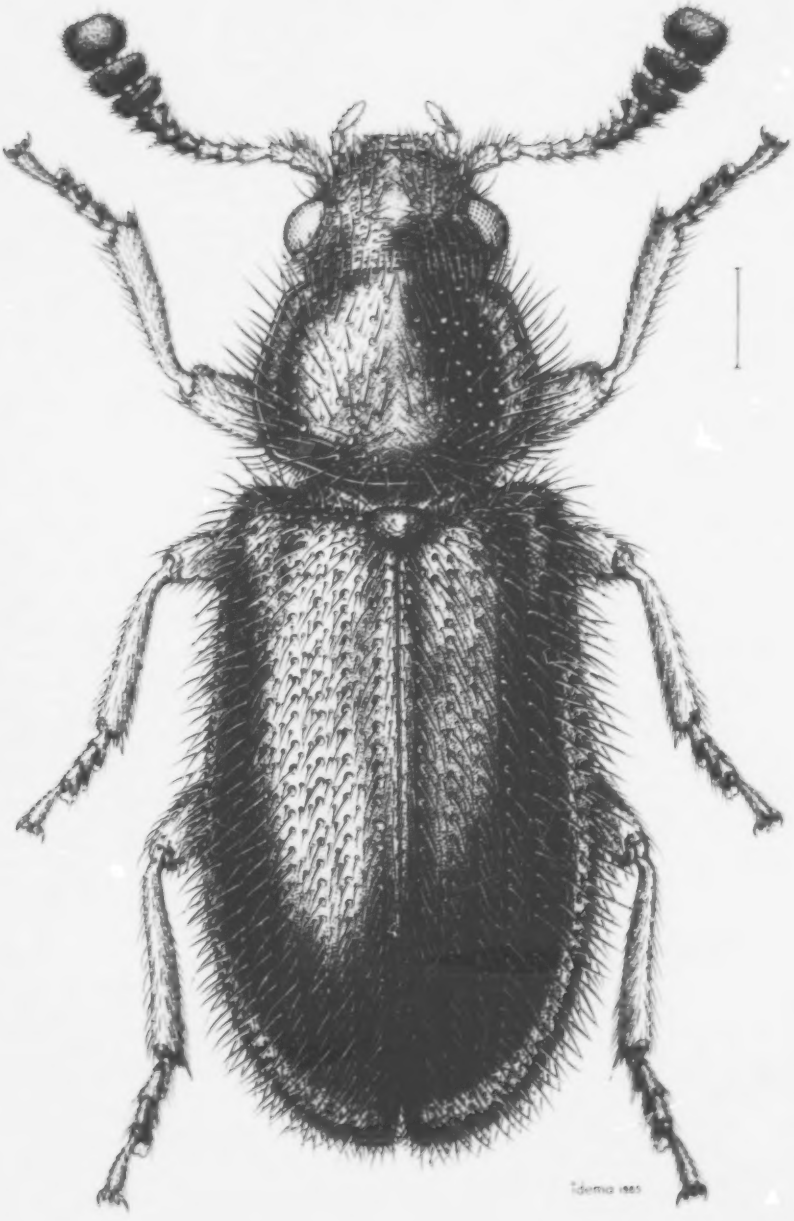


Fig. 185 *Necrobia rufipes* (De Geer). Scale = 0.5 mm.

Diagnosis: The species is readily distinguished from the other clerid associated with stored products in Canada, *N. violacea*, in having the legs pale, yellowish to reddish.

Sexual dimorphism: Males have the elytral setae rather uniform and obliquely raised to subdecumbent. Females have the elytral setae on the striae stouter and more erect than those on the intervals.

Distribution: Cosmopolitan but more predominant in the tropics. In Canada the species has been recorded from Nova Scotia west to British Columbia. It probably can survive winter conditions in this country only in heated premises.

Economic importance: This species is a well-known pest of copra and materials of animal origin. In India it is also recorded as a serious pest of cashew nuts (Sengupta et al., 1984). The species can also survive on the remains of other insects. According to Ashman (1962), members of *N. rufipes* can subsist on a diet of copra alone, but their development is slow; their diet is almost certainly supplemented by predation on other insects. In Canada the species is of little concern, although it sometimes escapes in great numbers from ships carrying copra (Barr 1962).

Necrobia violacea (Linnaeus)

Diagnosis: The species differs from *N. rufipes*, among others, in having piceous or black legs.

Sexual dimorphism: Sexes are externally similar.

Distribution: Cosmopolitan. The species occurs throughout the temperate regions of Canada.

Economic importance: This species is found occasionally in association with stored products; it probably survives mainly on the remains of other insects.

Selected references

Ashman, F. 1962. Factors affecting the abundance of the copra beetle, *Necrobia rufipes* (Deg.) (Col., Cleridae). Bull. Entomol. Res. 53:671–680.

Simmons, P.; Ellington, G.W. 1925. The ham beetle, *Necrobia rufipes* De Geer. J. Agric. Res. 30:845–863.

CRYPTOPHAGIDAE silken fungus beetles

This family of small beetles includes about 50 species in Canada. They are found most commonly in and under the following: nests of social Hymenoptera, birds, and small mammals; and bark, rotten wood, vegetable debris, fungi, and moldy materials. Adults and larvae apparently feed mainly on spores and hyphae of mold.

Many species of cryptophagids are found regularly in buildings or are associated with stored products. They have no direct effect on the products, as they feed on mold. Their presence is indicative of poor storage conditions and moldy materials.

Atomaria Stephens

Diagnosis: Species of *Atomaria* occurring in Canada differ from the other cryptophagids dealt with here in having the antennal insertions close together and located on the frons. They also differ from members of *Cryptophagus* in having the anterior angle of the pronotum unthickened and from those of *Henoticus* in having the lateral margins of the pronotum not denticulate.

About 20 species of this genus are currently known in Canada, and most of them could be encountered on moldy products in dwellings. The North American species of the genus are in need of a taxonomic revision.

Economic importance: As stated for the family.

Cryptophagus acutangulus Gyllenhal

Diagnosis: The species is distinctive among the species of *Cryptophagus* dealt with here in having the pronotum widest at the level of the anterior angles. In other species of the genus the pronotum is widest at the level of the lateral teeth, or its width is subequal across the anterior angles and the lateral teeth.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Although its distribution may have been influenced by commerce, Woodroffe and Coombs (1961) believe that this species is truly Holarctic. In Canada it has been reported in Newfoundland and from Quebec west to British Columbia.

Economic importance: As mentioned for the family. The species has been recorded by Aitken (1975) on Canadian cargo ships carrying soybean meal.

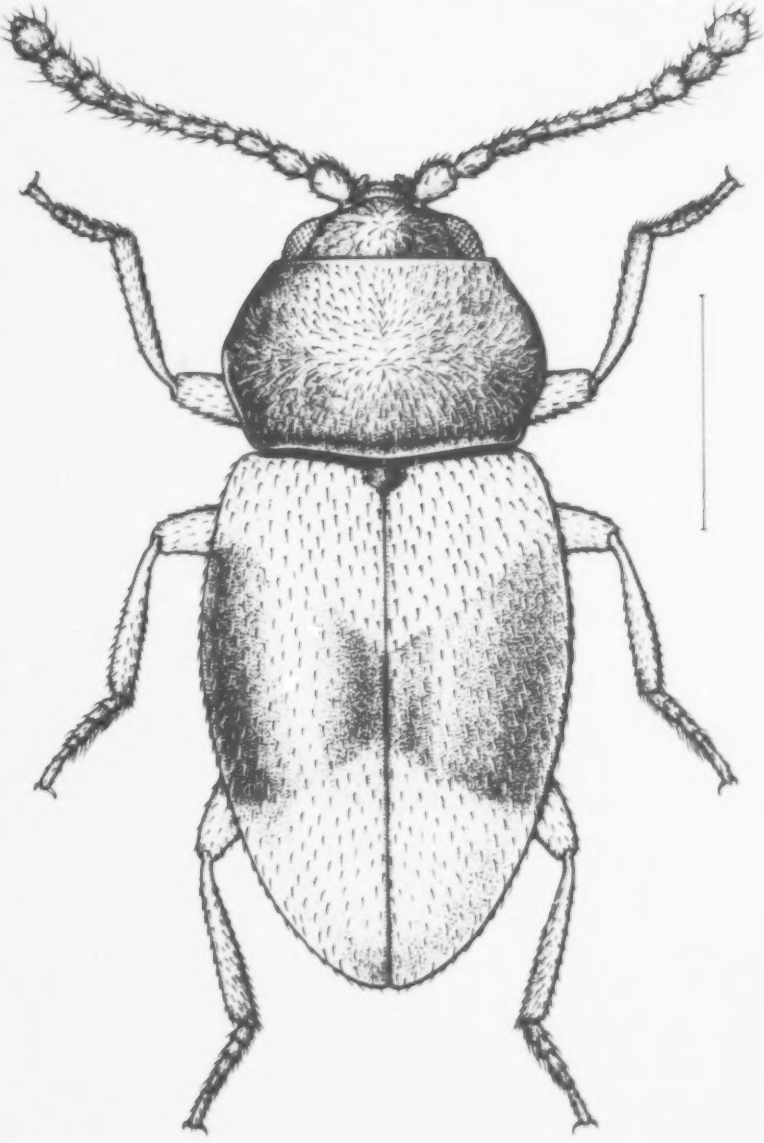


Fig. 188 *Atomoria ephippiata* Zimmermann. Scale = 0.5 mm.

Cryptophagus cellaris (Scopoli)

Diagnosis: The species differs from the other *Cryptophagus* dealt with here in having the eyes large (but not prominent) and hemispherical, and an unusual type of elytral pubescence that consists of small, decumbent setae and longer ones, slightly raised and arranged in vertical rows.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Nearly cosmopolitan (Woodroffe and Coombs 1961). The species has been found in all Canadian provinces from Quebec west to British Columbia.

Economic importance: As discussed for the family. The species has been recorded on Canadian cargo ships carrying wheat, flour, soybean meal, and beans (Aitken 1975).

Cryptophagus laticollis Lucas

Diagnosis: This *Cryptophagus* is distinctive among the species of the genus studied here in having the eyes small, clearly conical, and somewhat flattened anteriorly.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Europe and introduced in western North America. The species is known in this country in Alberta and British Columbia.

Economic importance: As stated for the family.

Cryptophagus obsoletus Reitter

Diagnosis: The species differs from the other *Cryptophagus* with single elytral pubescence in having the anterior angle of the pronotum drawn out posteriorly and the lateral margins only slightly convergent behind the lateral teeth. Typical specimens of *C. obsoletus* are also different from those of most other *Cryptophagus* dealt with here in having the dorsum of the body blackish, with yellowish to reddish markings on the elytra, particularly at the shoulders and near the apex.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Palaearctic region and introduced in North America. In Canada the species is known in Ontario and Manitoba.

Economic importance: As stated for the family.

Cryptophagus pilosus Gyllenhal

Diagnosis: This species is unusually variable, particularly the elytral pubescence, which may be single (only short setae) or double (short and long setae). Individuals with double elytral pubescence are recognizable in having the anterior angle of the pronotum drawn out into a fine point posteriorly and the lateral tooth located near the middle of the side. Those with single pubescence resemble *C. obsoletus* but differ in having the lateral margins of the pronotum more convergent toward the base and a usually uniformly reddish brown elytral integument.

Adults of *C. pilosus* with single elytral pubescence are externally similar to those of *C. distinguendus* Sturm, a species introduced in North America and known in Canada only in British Columbia. Compared with *C. pilosus*, adults of *C. distinguendus* are normally smaller (1.6–2.2 mm) and usually have the lateral tooth slightly behind the middle of the side. Although many specimens of both species are separated by these characteristics, some can be determined only by examination of the male genitalia. Members of *C. distinguendus* have been found associated with stored products in Europe.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: More or less cosmopolitan (Woodroffe and Coombs 1961). In Canada the species has been recorded from Ontario west to British Columbia.

Economic importance: As mentioned for the family.

Cryptophagus saginatus Sturm

Diagnosis: Because of the uniformly reddish brown body, the anterior angles of the pronotum not drawn out posteriorly, and the single elytral pubescence, *C. saginatus* can be confused, among the species of *Cryptophagus* dealt with here, only with *C. scutellatus* and *C. subfumatus*. It differs from *C. scutellatus* mainly by its larger size (length more than 1.9 mm) and in having denser pronotal punctation (punctures separated by one-half to three-quarters of their diameter) and from *C. subfumatus* mainly in having the anterior angles of

pronotum not prominent anteriorly and the lateral tooth located in front of the middle of the side.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Europe, northern Asia, and North America, where it is probably introduced. According to Coombs and Woodroffe (1955), *C. saginatus* is one of the commonest species indoors in Great Britain as well as being abundant in the wild. In Canada the species has been found in Ontario and British Columbia.

Economic importance: As stated for the family. The species has been recorded on Canadian cargo ships carrying soybean meal (Aitken 1975).

Cryptophagus scanicus (Linnaeus)

Diagnosis: The species differs from the other *Cryptophagus* with single elytral pubescence in having the anterior angles of the pronotum not drawn out posteriorly and the dorsum of body bicolorous—the head and pronotum being reddish and the elytra more or less blackish, except along the humeral region. Uniformly reddish specimens are known in Europe, but so far, only bicolorous specimens have been found in North America.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: One of the commonest species in the Palaearctic region; introduced in North America and known only in Newfoundland.

Economic importance: As discussed for the family.

Cryptophagus scutellatus Newman

Diagnosis: The species is readily distinguishable from the other *Cryptophagus* with single elytral pubescence by its small size (length less than 1.9 mm) and the sparse pronotal punctation (punctures separated by their diameter or more). The shape of the pronotum is also characteristic of this species, particularly the small anterior angles and the lateral teeth located well in front of the middle of the sides.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Europe and introduced in North America. The species is known in Canada in Ontario and Alberta.

Economic importance: As stated for the family.

Cryptophagus setulosus Sturm

Diagnosis: Among the species of *Cryptophagus* with double elytral pubescence and with the anterior angles of the pronotum not drawn out posteriorly, *C. setulosus* can be confused only with *C. laticollis* and *C. cellaris*. It differs from *C. laticollis* mainly in having the eyes only slightly conical and not flattened anteriorly, and from *C. cella*ris in having the longer setae of the elytral pubescence suberect and conspicuous.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: According to Woodroffe and Coombs (1961), probably Holarctic. However, since the species is found in the Old World only in Europe and North Africa, it is more likely that it was introduced in North America. In Canada the species is known in Quebec, Ontario, and British Columbia.

Economic importance: As mentioned for the family. In Europe the species is found most frequently in nests of bees and wasps (Woodroffe and Coombs 1961).

Cryptophagus stromus Woodroffe & Coombs

Diagnosis: Among the species of *Cryptophagus* with double elytral pubescence, *C. stromus* is recognizable by the rather quadrate pronotum, with the lateral tooth in front of the middle of the side.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Exclusively North American. In Canada the species is known in Manitoba and Saskatchewan.

Economic importance: As stated for the family.

Cryptophagus subfumatus Kraatz

Diagnosis: The species differs from the other *Cryptophagus* with single elytral pubescence in having the anterior angles of the

pronotum distinctly prominent anteriorly and not drawn out posteriorly.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Nearly cosmopolitan (Hinton 1945). The species is probably introduced in North America and in Canada occurs from Quebec west to British Columbia.

Economic importance: As discussed for the family. Woodroffe and Coombs (1961) noted that *C. subfumatus* is usually found on dried fruit in Europe and on grain in North America.

Cryptophagus varus Woodroffe & Coombs

Diagnosis: The species is distinctive among the *Cryptophagus* dealt with here by the strongly sinuated sides of the pronotum, which are concave in front of the lateral tooth and convex behind.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Exclusively North American. In Canada the species is known from Manitoba west to British Columbia and also in Quebec.

Economic importance: As mentioned for the family. This species is one of the most common beetles found in granaries in the Prairie Provinces (Smith and Barker 1987).

Henoticus californicus (Mannerheim)

Diagnosis: The species and its relative *H. serratus* differ from the other cryptophagids dealt with here in having the lateral margins of the pronotum denticulate and a deep, transverse, smooth impression on the base of the pronotum. Adults of *H. californicus* differ from those of *H. serratus* mainly in having smaller eyes and the lateral margins of the pronotum asymmetrically arcuate.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: North America and introduced in Europe; possibly established in New Zealand (Archibald and Chalmers 1983). In Canada the species is known only in British Columbia.

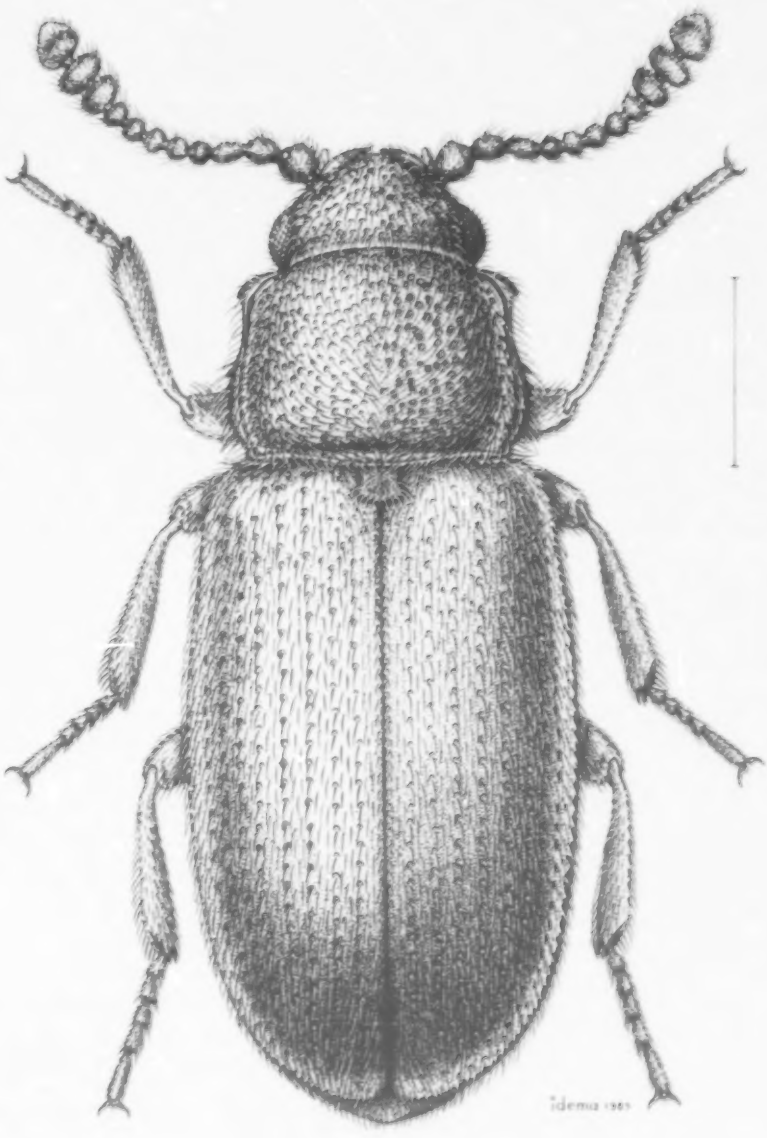


Fig. 187 *Cryptophagus varus* Woodroffe & Coombs. Scale = 0.5 mm.

Economic importance: As stated for the family.

Henoticus serratus (Gyllenhal)

Diagnosis: The species is readily distinguished from *H. californicus* in having larger eyes and the lateral margins of the pronotum evenly arcuate.

Sexual dimorphism: Males have 4-segmented hind tarsi, females 5-segmented ones (Fig. 244).

Distribution: Widely distributed in North America and Europe. In Canada the species is known in Quebec, Ontario, Manitoba, and British Columbia.

Economic importance: As stated for the family.

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CUCUJIDAE flat bark beetles

The family includes about 30 species in Canada. The adults are usually found under the bark of dead trees, in logs, and in decaying plant material. Some species apparently feed on fungi and decaying material, others prey on insects.

Six species of cucujids occurring in Canada are associated with stored products; four of them are among the most serious pests.

Some genera in this family, for instance *Ahasverus* and *Oryzaephilus*, are considered by a number of authors as belonging to a distinct family, the Silvanidae. This approach has not been followed here.

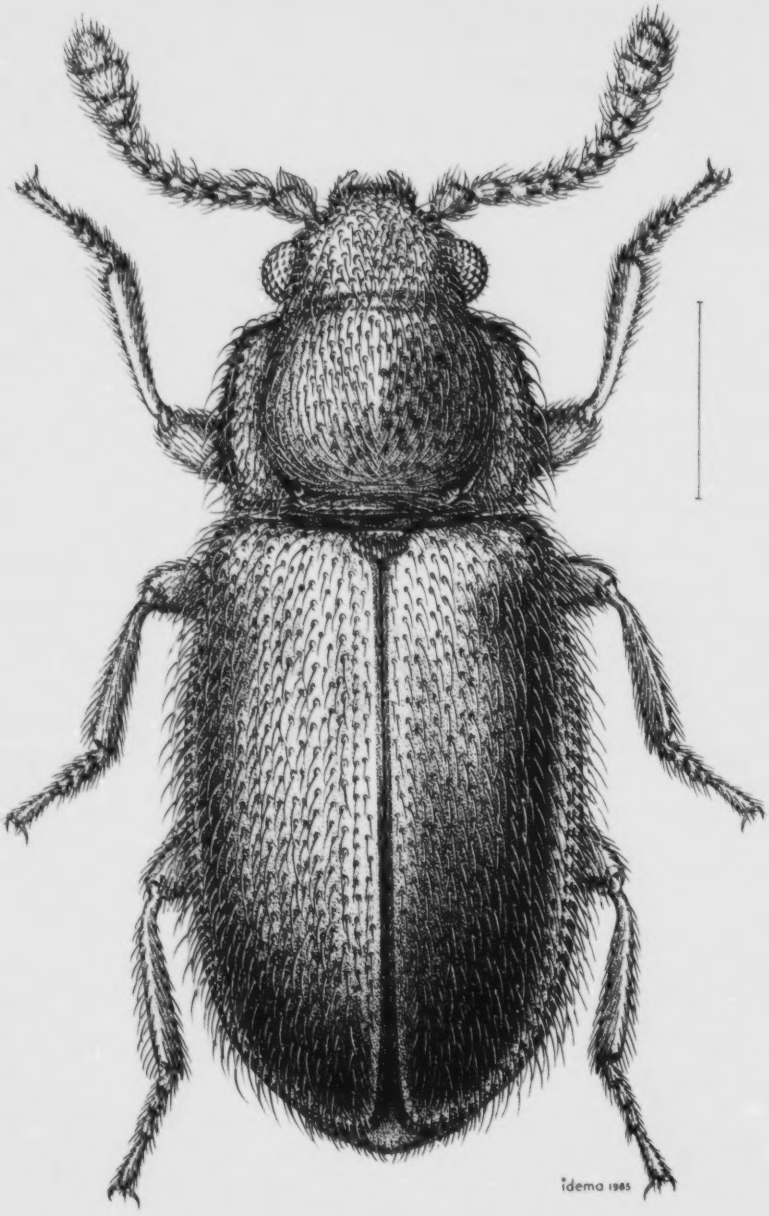

Fig. 188 ***Henoticus serratus*** **(Gyllenhal). Scale = 0.5 mm.**

Ahasverus advena (Waltl)
foreign grain beetle
cucujide des grains

Diagnosis: The species is readily recognized among the Coleoptera dealt with here by its general habitus (Fig. 189), particularly the protuberant anterior angles of the pronotum.

Sexual dimorphism: Males are externally similar to females.

Distribution: Throughout the temperate, subtropical, and tropical regions. In Canada the species ranges from Nova Scotia west to British Columbia.

Economic importance: This secondary pest is often reported in Canada in granaries, mills, and warehouses. Watters (1976) mentioned that it is the most common fungus beetle associated with grain in the Prairie Provinces. It occurs in a wide range of stored foodstuffs, such as grain, dried fruit, cereals, nuts, particularly in products that are damp and moldy. Both adults and larvae feed on mold and, provided the relative humidity is over 65%, can also damage stored products. Woodroffe (1962) and Hill (1964) showed that a nutrient found in mold and dried yeast is essential for the development of *A. advena*. The species can grow in pure cultures of several seed-borne fungi.

Cryptolestes ferrugineus (Stephens)
rusty grain beetle
cucujide roux

Diagnosis: Adults of *Cryptolestes* occurring in Canada are easily recognized among the Coleoptera dealt with here by their general habitus (Figs. 190 and 191), particularly their small, depressed body and the presence of a carina on the pronotum. *Cryptolestes ferrugineus* differs from the two other species of the genus discussed here in having the carina on the head not extended transversely near the posterior margin. Both this species and *C. pusillus* have 4 rows of setae on the second elytral interval.

Sexual dimorphism: Males have the mandible expanded laterally near the base (Fig. 246) and 4-segmented hind tarsi. Females have the mandible not expanded at base (Fig. 246) and 5-segmented hind tarsi. Unlike *C. pusillus* and *C. turcicus*, the length of the antennae is not sexually dimorphic in *C. ferrugineus*.

Distribution: Cosmopolitan. In Canada the species occurs from coast to coast.

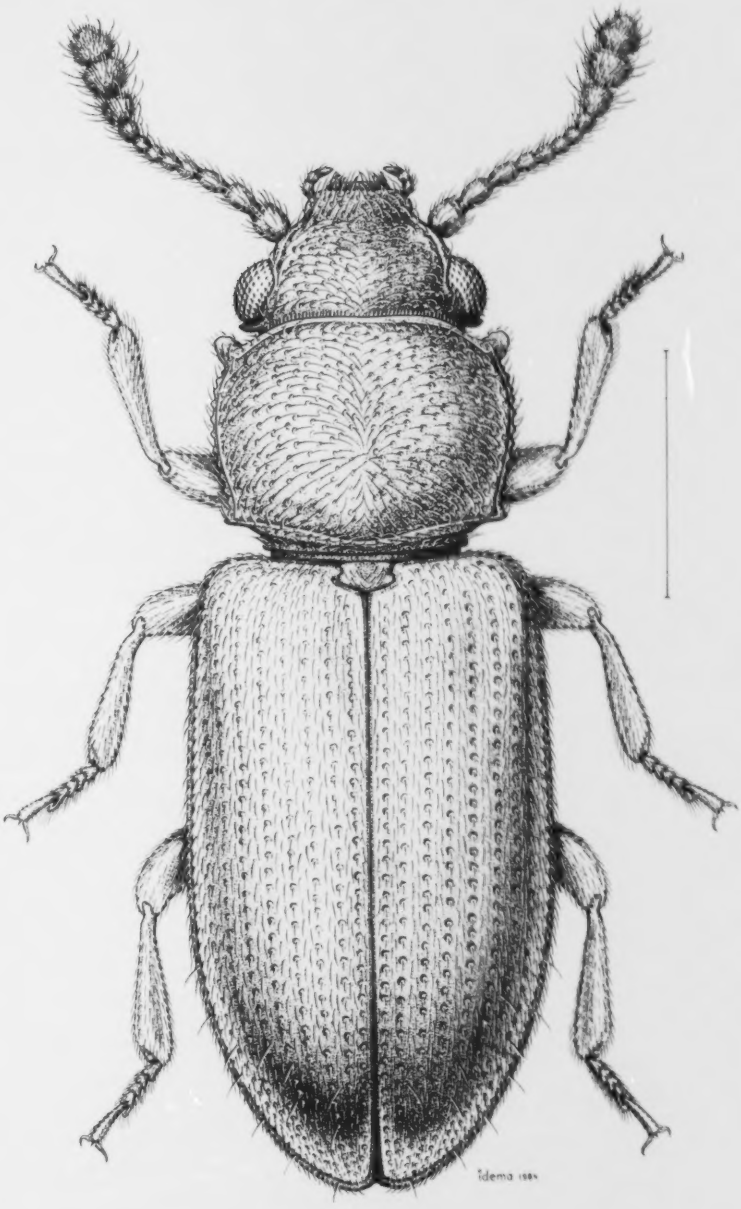

Fig. 189 ***Ahasverus advena*** **(Waltl). Scale = 0.5 mm.**

Economic importance: This species is the most serious pest of stored grain, particularly wheat, in Canada (Watters 1955; Sinha 1961). According to Rilett (1949), *C. ferrugineus* became a major pest of stored grain in western Canada during the years 1939–1944. It is found mainly in granaries, grain elevators, and mills, where both adults and larvae feed almost exclusively on the germ of the grain kernel. In tropical and subtropical regions it also infests oilseeds and cocoa beans (Howe and Lefkovitch 1957).

Cryptolestes pusillus (Schönherr) (synonym: *C. minutus* Olivier)
flat grain beetle
cucujide plat

Diagnosis: The species differs from *C. ferrugineus* in having the carina on the head extended transversely near the posterior margin and from *C. turcicus* in having 4 rows of setae, instead of 3, on the second elytral interval and the carina on the head stronger.

Sexual dimorphism: Males have the antennae extended to about four-fifths of the length of the body (see Fig. 190) and 4-segmented hind tarsi. Females have shorter antennae, extended to about half the length of the body (see Fig. 191), and 5-segmented hind tarsi.

Distribution: Recorded from many countries but more common in wet-tropical and warm-temperate regions. In Canada the species has been reported from Quebec west to British Columbia, but some of these records could have resulted from misidentification of *C. turcicus*. The species can survive Canadian winter conditions only in a heated environment.

Economic importance: The flat grain beetle is probably the least damaging *Cryptolestes* species in Canada. It is found mainly in grain elevators and flour mills, more or less frequently in Quebec and Ontario and occasionally in the Prairie Provinces and British Columbia. The species was described as a serious pest of flour mills in Canada (MacNay 1950; Arrand and Neilson 1958), probably as a result of confusion with *C. turcicus*. As for C. *ferrugineus*, it feeds mainly on damaged grain, preferably wheat.

Cryptolestes turcicus (Grouvelle)
flour mill beetle

Diagnosis: The species is distinct from the two other *Cryptolestes* dealt with here in having 3 rows of setae, instead of 4, in the second elytral interval.

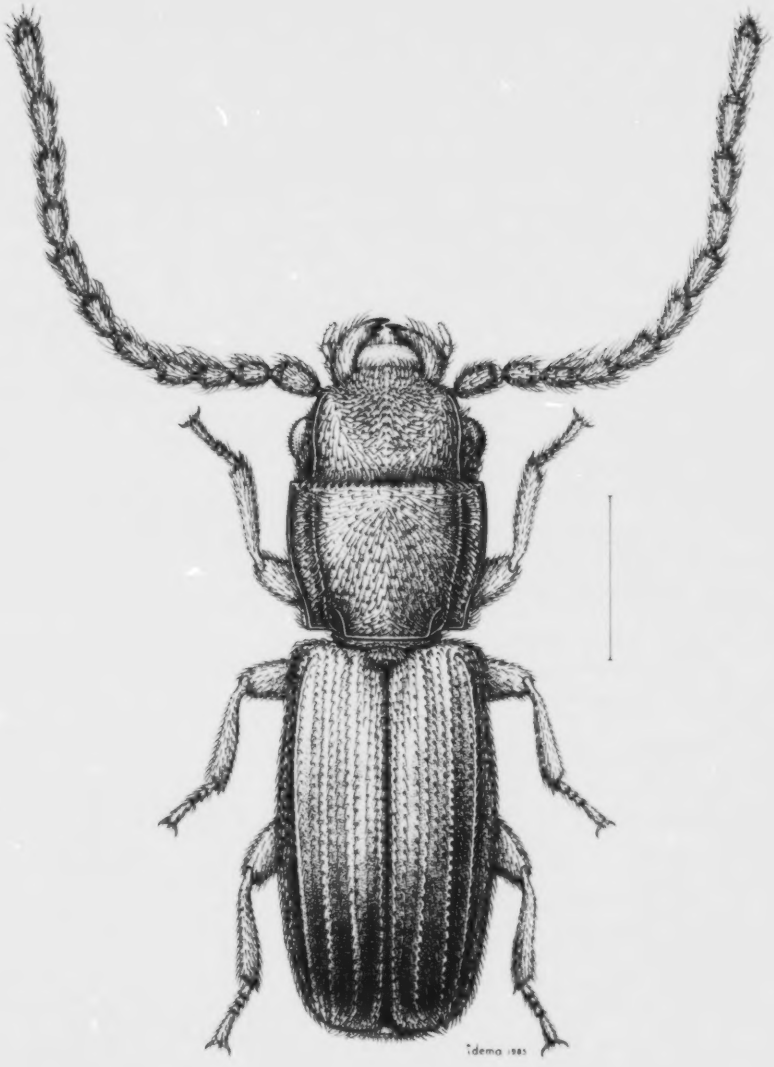

Fig. 190 ***Cryptolestes turcicus*** **(Grouvelle); male. Scale = 0.5 mm.**

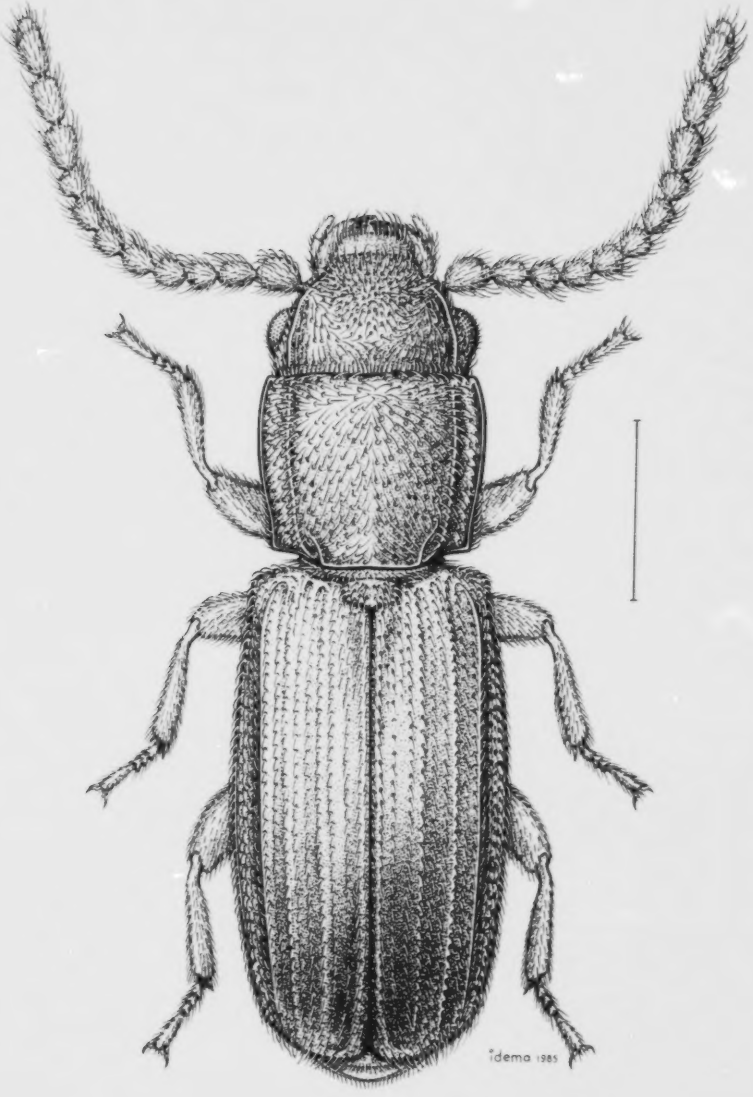

Fig. 191 ***Cryptolestes turcicus*** **(Grouvelle); female. Scale = 0.5 mm.**

Sexual dimorphism: Males have longer antennae, extended to about four-fifths of the length of the body (see Fig. 190), and 4-segmented hind tarsi. Females have the antennae extended to only about half the length of the body (see Fig. 191) and 5-segmented hind tarsi.

Distribution: Found in Europe, North Africa, and North America and reported in Japan, South Africa, and some South American countries. In Canada the species has been found from Quebec west to British Columbia.

Economic importance: This insect is a notorious pest of flour and feed mills in temperate regions. It is also found occasionally in grain elevators and warehouses in Canada (Smith 1962, 1965). As shown by Chang and Loschiavo (1971), the development of this species is favored by the presence of fungi in its diet. Aitken (1975) recorded the species in Canadian cargo ships carrying wheat.

Oryzaephilus mercator (Fauvel)
merchant grain beetle
cucujide des grains oléagineux

Diagnosis: The two species of *Oryzaephilus* included here are easily separated from the other Coleoptera species dealt with in this guide by their general habitus (Fig. 192), particularly the 6-toothed lateral margin of the pronotum. *Oryzaephilus mercator* differs from *O. surinamensis* mainly in having the temple proportionally shorter, its length being less than half the vertical diameter of the eye.

Sexual dimorphism: Males have the posterior margin of the hind trochanter and the upper margin of the hind femur medially with a spine-like projection; females lack such projection on the hind trochanter and femur (Fig. 245).

Distribution: Cosmopolitan. The species occurs in heated food-storing premises across Canada.

Economic importance: This species is one of the most common household pests in Canada, found more frequently in apartments and other multiple dwellings than in houses. Loschiavo and Sabourin (1982) estimated that the total cost of infestation in Canadian residences reached $6 million in 1980. Both adults and larvae feed mainly on cereal products, particularly those with high oil content such as oatmeal, bran, shelled sunflower seeds, rolled oats, and brown rice (Loschiavo and Smith 1970; Loschiavo 1976). Unlike *O. surinamensis*, *O. mercator* has not been reported as a pest of stored grain in Canada.

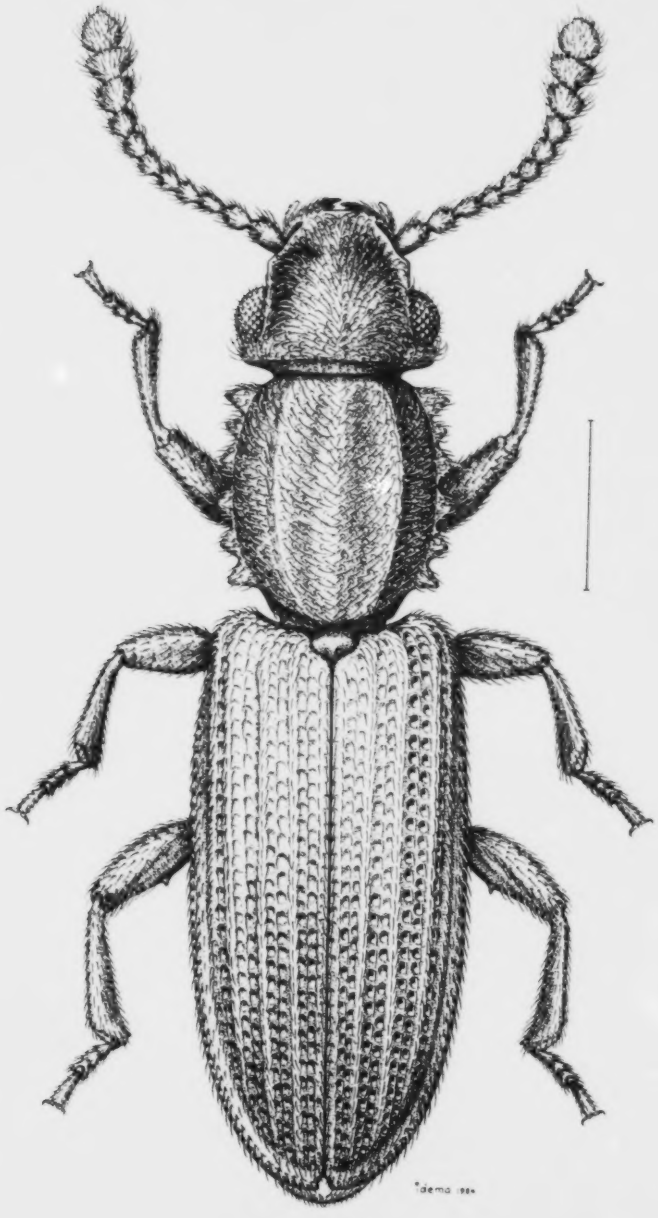

Fig. 192 ***Oryzaephilus mercator*** **(Fauvel). Scale = 0.5 mm.**

Oryzaephilus surinamensis (Linnaeus)
sawtoothed grain beetle
cucujide dentelé des grains

Diagnosis: The species differs from *O. mercator* in having the temple proportionally longer, its length being equal to or more than half the vertical diameter of the eye.

Sexual dimorphism: As in *O. mercator*, males have the posterior margin of the hind trochanter and the upper margin of the hind femur medially with a spine-like projection; females lack such projection on the hind trochanter and femur (Fig. 245).

Distribution: Cosmopolitan. The species is found across Canada in the temperate regions. Unlike *O. mercator*, it can survive Canadian winter conditions in unheated premises.

Economic importance: In Canada this species is a serious pest of stored grain and occurs primarily in granaries, grain elevators, and flour mills. Both adults and larvae attack damaged grain and processed cereals. Its presence in household products is incidental and causes little concern (Loschiavo and Sabourin 1982).

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CURCULIONIDAE snout beetles

The Curculionidae is one of the largest families of beetles in Canada, with approximatively 900 reported species. Members of this family are all plant feeders. The adults of most species feed on pollen, fruit, flowers, leaves, and fungi. The larvae of many species feed inside the plants, and a few feed outside on the leaves; some are leafminers.

Most curculionids of economic importance in Canada attack growing crops or trees and shrubs. Only one species is associated with stored products; two others, however, are occasionally found on imported grain. These three species are among the most serious pests of stored grain.

Sitophilus granarius (Linnaeus)
granary weevil
calandre des grains

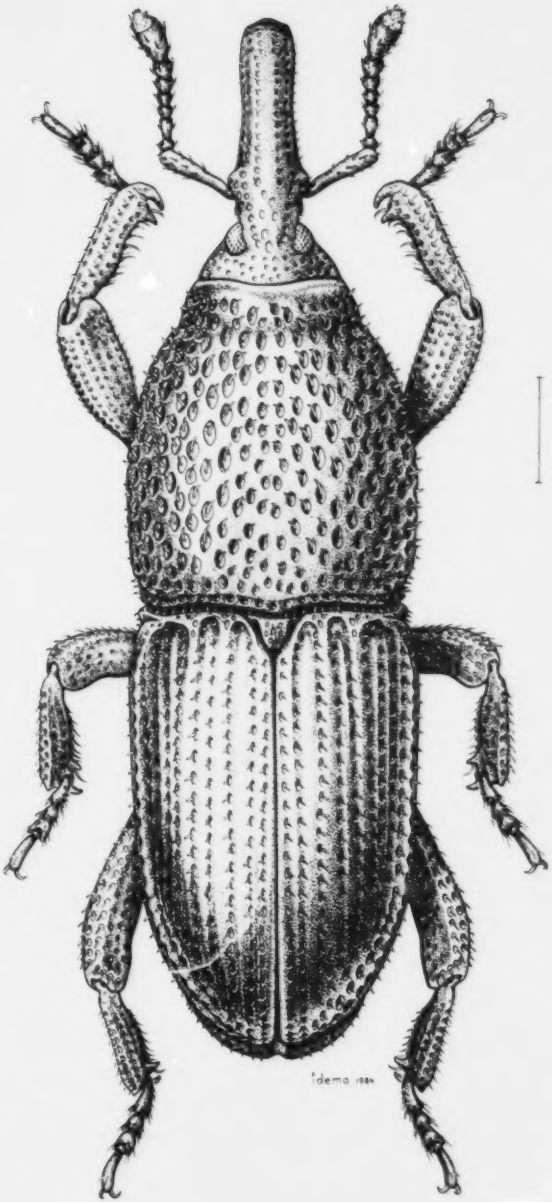

Fig. 193 ***Sitophilus granarius*** **(Linnaeus). Scale = 0.5 mm.**

Diagnosis: The species is distinct from *S. oryzae* in having the hind wings reduced, the elytral intervals at least as wide as the striae, the strial punctures small and clearly separated, and the pronotal punctures distinctly elongate.

Sexual dimorphism: Males have the abdominal sterna V and VI distinctly deflected (Fig. 247), and the rostrum usually wider and less elongate. Females do not have the abdominal sterna V and VI deflected (Fig. 247), and the rostrum is usually narrower and more elongate.

Distribution: Throughout the temperate regions. The species is known in Canada from coast to coast.

Economic importance: This species is a notorious pest of stored grain. In Canada it causes significant damage primarily in southern Ontario, where it is found in granaries, grain elevators, and flour mills; in other provinces, the species is encountered only occasionally. The adults and larvae feed on a wide variety of grains, and the adults also feed on flour. The eggs are laid beneath the seed coat in a hole chewed by the females and closed with saliva. The larvae feed on the endosperm, pass through four instars, and pupate inside the grain. The newly emerged adult chews its way out of the kernel, leaving a characteristic emergence hole. Adults are flightless, and the species is restricted to stored grain.

Sitophilus oryzae (Linnaeus)
rice weevil
charançon du riz

Diagnosis: The species differs from *S. granarius* in having the hind wings fully developed, the elytral intervals narrower than the striae, the strial punctures large and nearly contiguous, and the pronotal punctures circular to slightly elongate.

This species is closely related to *S. zeamais* Motschulsky, another serious pest of stored grain in tropical, subtropical, and warm temperate regions. Both species were known under the name *S. oryzae* until recently. They can be separated with confidence only by examination of the male genitalia. In *S. oryzae* the dorsal surface of the median lobe is evenly convex, whereas in *S. zeamais* it is flattened with a longitudinal impression on each side of the middle (Halstead 1963*b*). Other characters that may be useful for separating these two species when they occur in mixed infestations include the shape of the pronotal punctures (usually slightly elongate in *S. oryzae*, mostly circular in *S. zeamais*), the pronotal punctation along the midline (usually absent in *S. oryzae* and usually present in *S. zeamais*), and the size and coloration (smaller and paler in *S. oryzae*). *Sitophilus zeamais* is not established in Canada but has been intercepted at ports

of entry or has been present for several years in areas like Montreal, where U.S. grain is stored.

Sexual dimorphism: As in *S. granarius*, males have the abdominal sterna V and VI distinctly deflected (Fig. 247) and the rostrum less elongate (length-to-width index, around 5.5). Females have the abdominal sterna V and VI horizontal or only slightly deflected (Fig. 247) and the rostrum more elongate (length-to-width index, more than 7.0).

Distribution: Occurs throughout the warm temperate, subtropical, and tropical regions. The species has been reported sporadically in most Canadian provinces.

Economic importance: This species is one of the most serious pests of stored grain in the world. It is established in Canada only in southern Ontario but is found more or less frequently across the country on imported grain. The adults and larvae feed on a wide variety of grains and show a preference for wheat; the adults also eat flour. Unlike *S. granarius*, adults can fly and find their way to nearby ripening cereal crops, where they cause preharvest problems.

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DERMESTIDAE dermestid beetles

This family includes approximately 40 species in Canada. Their members are found more commonly on flowers and dried animal carcasses, and in nests of mammals, birds, and social Hymenoptera as well as dwellings. Most species feed almost exclusively on materials of animal origin such as bones, skins, fur, wool, and silk. Some species, however, can subsist partly or wholly on vegetable matter, and a few, such as *Trogoderma granarium*, feed exclusively on vegetable material.

About half the dermestid species occurring in Canada are household and museum pests or are associated with stored products. Many of these species, however, are not serious pests. In some groups, such as *Dermestes* and *Thylodrias*, both adults and larvae are harmful to human commodities, although the damage caused by the larvae is more important. In other genera, such as *Anthrenus*, *Attagenus*, and *Trogoderma*, only the larvae are economically important, since the adults do not feed or, if they do, feed outdoors on pollen and nectar.

Anthrenus fuscus Olivier

Diagnosis: The species is readily separated from the other *Anthrenus* dealt with here in having the antenna 5-segmented with a 1-segmented club.

Sexual dimorphism: Males have the last antennal segment proportionally longer (at least five times as long as the 2 preceding segments combined) (Fig. 248) and the antennal cavity of the prothorax also proportionally longer (occupying about two-thirds of the lateral margin). In females the last antennal segment is three to four times as long as the 2 preceding segments combined (Fig. 248), and the antennal cavity occupies about half of the lateral margin of the prothorax.

Distribution: Europe and introduced in eastern North America. In Canada the species is known in southern Quebec and southern Ontario.

Economic importance: This species is a minor pest in North America. It has been found in flour mills, warehouses, and houses, where the larvae probably survive on the remains of insects. In Europe *A. fuscus* has been recorded damaging dried insect collections; it also occurs in bird nests, aculeate Hymenoptera nests, and in and around spider webs.

Anthrenus museorum (Linnaeus)
museum beetle

Diagnosis: The species is distinctive among the *Anthrenus* included here in having the antenna 8-segmented with a 2-segmented club.

Externally, this species is similar to *A. castaneae* Melsheimer, and it is possible that earlier records of *A. museorum* refer to *A. castaneae*. Adults of *A. castaneae* differ in having the last antennal segment proportionally shorter, 2–3 times as long as the preceding segment in the male and 1.4–2.2 in the female. In *A. museorum* the last antennal segment is at least five times as long as the preceding segment in the male and 2.1–2.8 in the female (Hoebeke et al. 1985). *Anthrenus castaneae* is exclusively North American and more common than *A. museorum*. The species has not been found associated with stored products (R.S. Beal, Jr., personal communication).

Sexual dimorphism: Males have the last antennal segment at least five times as long as the preceding one; females have that segment only two to three times as long as the preceding one (Fig 249).

Distribution: Most of the Holarctic region and reported also from Australia, New Zealand, and Java in Indonesia (Hinton 1945). In Canada the species has been recorded from Newfoundland west to Ontario, but I have seen only specimens of *A. museorum* from St. John's, Nfld., and from the Ottawa region.

Economic importance: This species is mainly a household pest; the larvae feed on wool, fur, skins, and other materials of animal origin. It also damages dried insect collections and other museum specimens. There are few records of this species in Canada, and it is probably only a minor pest. Like the other species of the genus, the adults feed on nectar and pollen, mate in the field, and fly indoors to oviposit.

Anthrenus scrophulariae (Linnaeus)
carpet beetle
anthrène des tapis

Diagnosis: The species differs from the other *Anthrenus* included here in having the medial margin of the eye notched.

Sexual dimorphism: Sexes are externally similar.

Distribution: Palaearctic region and introduced in North America and the Australian region. In Canada *A. scrophulariae* is found from coast to coast.

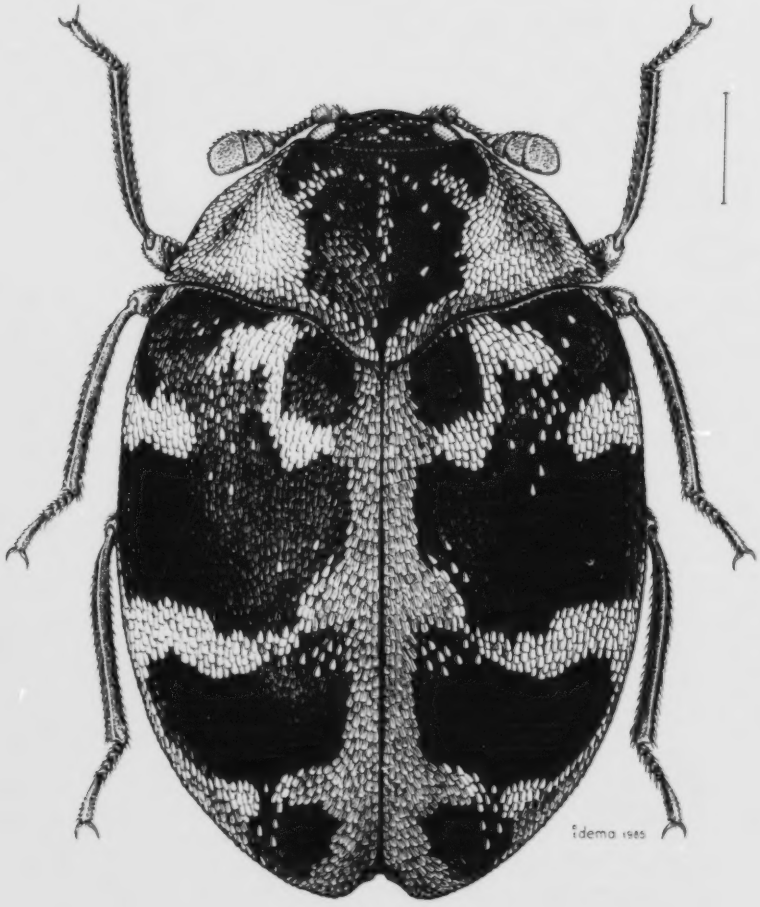

Fig. 194 ***Anthrenus scrophulariae*** **(Linnaeus). Scale = 0.5 mm.**

Economic importance: As is the preceding species, *A. scrophulariae* is mainly a household pest and is also known to attack dried insect collections. The damage is done by the larvae. The adults feed on nectar and pollen.

Anthrenus verbasci (Linnaeus)
varied carpet beetle
anthrène bigarré des tapis

Diagnosis: The species is distinct from the other *Anthrenus* included here in having the antenna 11-segmented with the medial margin of the eye entire. It also differs from *A. scrophulariae*, the only other *Anthrenus* with an 11-segmented antenna included in this guide, in having the scales on the body more than twice as long as wide.

Sexual dimorphism: Sexes are externally similar.

Distribution: Throughout most of the temperate regions. The species was introduced in North America around 1850; it occurs in Canada from coast to coast.

Economic importance: This species is found occasionally in flour mills and warehouses but is best known as a household pest. The larvae feed on a wide variety of materials of animal origin such as wool, fur, and skins. They also cause concern by attacking dried insect collections and, in some countries, by destroying cocoons of silk worms. Hinton (1945) considers this species to be the most important pest of insect collections in temperate regions, if not around the world. In Canada the species is abundant in coastal areas of British Columbia, occasional in Ontario, and rare in the other provinces (MacNay 1974).

Attagenus unicolor (Brahm) (synonyms: *A. piceus* Olivier, *A. megatoma* Fabricius)
black carpet beetle
attagène des tapis

Diagnosis: This dermestid differs from the species of *Megatoma*, *Reesa*, and *Trogoderma* included here, with which it may be confused, in having the antennal cavity of the prothorax broadly open posteriorly with the first segment of the hind tarsus half as long as the second.

Halstead (1981) recognized three subspecies of *A. unicolor*: *A. unicolor unicolor* widely distributed in the world, *A. unicolor japonicus* Reitter (synonym: *A. unicolor canadensis* Casey) occurring in the oriental part of the Palaearctic region and introduced in the Nearctic

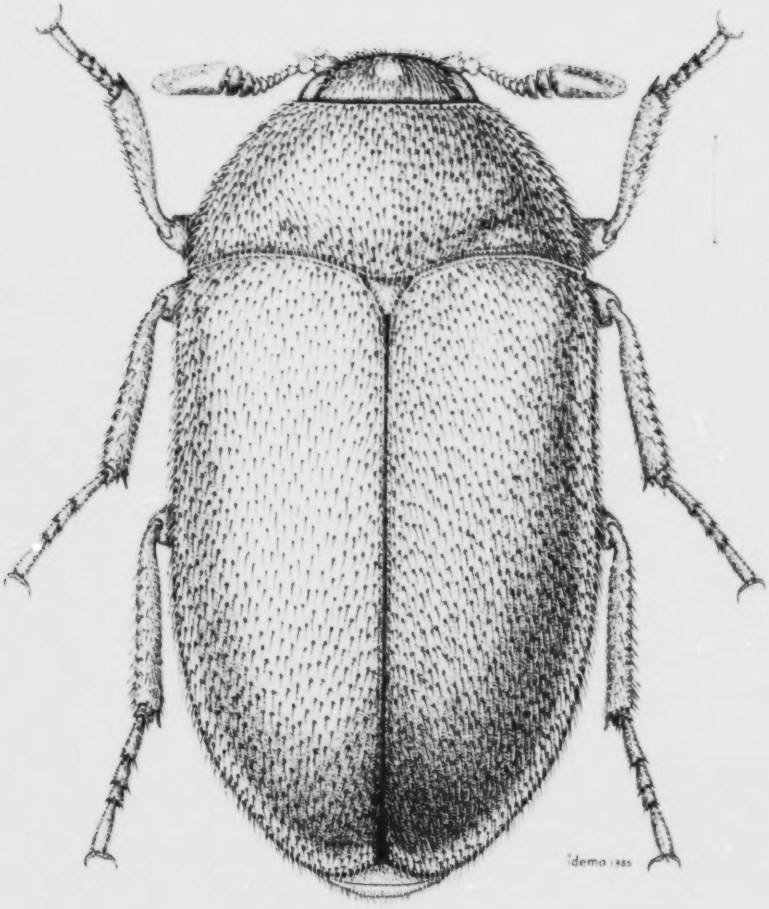

Fig. 195 ***Attagenus unicolor*** **(Brahm). Scale = 0.5 mm.**

region, and *A. unicolor simulans* Solskij known from Afghanistan, Central Asia, and Sinkiang Uighur in China. Adults of *A. unicolor unicolor* differ externally from those of *A. unicolor japonicus* in having the pronotum and elytra almost entirely covered with dark setae, whereas in *A. unicolor japonicus* the sides and base of the pronotum and the base of the elytra have distinctive golden brown setae.

Two other species of *Attagenus* occurring in North America warrant mention here, since they could be of economic importance in Canada. *Attagenus pellio* (Linnaeus) is a cosmopolitan species known in Canada from a few specimens collected in Nova Scotia, Quebec, Ontario, and British Columbia. The species has not been recorded as a pest in Canada, except for the report by Fletcher (1903), stating that it damaged carpets in Nova Scotia. In Europe the species is known as a major household pest, feeding during its larval stage on materials of animal origin such as wool, fur, and skins. It also occurs in warehouses, where it probably subsists mainly on the remains of insects, and has been recorded damaging museum specimens, particularly dried insect collections. Adults of *A. pellio* differ from those of *A. unicolor* mainly in having a contrasting tuft of white setae near the middle of each elytron.

Attagenus brunneus Faldermann (synonym: *A. elongatulus* Casey) occurs in the Palaearctic and Nearctic regions. In North America it is widespread in the United States and has been mentioned as occurring in Quebec and Ontario (Campbell et al. 1989). The Canadian records, however, require confirmation. As noted by Beal (1970), the species is found regularly in houses and has been reported to infest dried milk, woolens, and peanuts. Adults of *A. brunneus* are externally similar to those of *A. unicolor* but differ in that the last antennal segment of the male is generally more elongate (about 3.0–4.0 times as long as the 2 preceding segments instead of 3.0–3.5 times as in *A. unicolor*).

Sexual dimorphism: Males have the last antennal segment about 3.0–3.5 times as long as the 2 preceding segments combined; females have that segment subequal to slightly longer than the 2 preceding ones (Fig. 250).

Distribution: Nearly cosmopolitan (Beal 1970). The species ranges in Canada from coast to coast.

Economic importance: This species is one of the most common household pests in North America and during its larval stage feeds on wool, fur, skins, feathers, and other materials of animal origin. It is also found on grain spillages in grain elevators, flour mills, and feed mills, and has been known to attack museum specimens, particularly dried insect collections. The damage is done by the larvae, since the adults feed on nectar and pollen. Under natural conditions, *A. unicolor* occurs in nests of birds, rodents, and social Hymenoptera. The species is far less important as a pest in Europe.

Dermestes ater De Geer
black larder beetle
dermeste noir

Diagnosis: The species is distinct from the other *Dermestes* included here in having the dorsal setae predominantly black with some paler setae scattered among them. In the other species the pronotum or the elytra has extensive parts covered with pale, white, or golden setae.

Sexual dimorphism: Males have a tuft of setae on the middle of the third and fourth visible abdominal sterna (Fig. 261). Females have no such tuft of setae.

Distribution: Cosmopolitan. The species probably occurs in Canada from coast to coast.

Economic importance: Adults and larvae of this species are known to feed on a wide variety of materials of animal origin and to be predacious on other insects. They probably also feed on vegetable matter, since Woodroffe (1966) was partly successful in rearing the species on a diet of wheat germ. In addition, Aitken (1975) reported *D. ater* to be frequent on cargo ships carrying copra from the Ethiopian, Oriental, and Australian regions.

Dermestes frischii Kugelann

Diagnosis: The species differs from the other *Dermestes* dealt with here, except *D. maculatus*, in having the sides of the pronotum almost entirely covered with white setae. It is distinct from *D. maculatus* mainly in having the apical margin of each elytron smooth, with the apex rounded, and a different setal pattern on the last visible abdominal sternum (see Figs. 79 and 80).

Sexual dimorphism: Males have a tuft of setae on the middle of the fourth visible abdominal sternum. Females have no such tuft of setae.

Distribution: Probably cosmopolitan. In Canada the species is known from the Maritime Provinces west to Ontario and from British Columbia.

Economic importance: The species has been reported in Canada in granaries, warehouses, shops, and dwellings. Both adults and larvae feed on a wide variety of materials of animal origin and on the remains of insects. The larvae also cause damage by boring into materials such as cork and vegetable fibers, to pupate.

Dermestes lardarius Linnaeus
larder beetle
dermeste du lard

Diagnosis: The species is readily separated from the other *Dermestes* studied here by the coloration of the elytral vestiture: the apical half of each elytron is clothed with dark setae, and the basal half with white setae, except for a basal patch of dark setae and 3 small, rounded, sometimes contiguous patches of dark setae.

Sexual dimorphism: Males have a tuft of setae on the middle of the third and fourth visible abdominal sterna (Fig. 261). Females have no such tuft of setae.

Distribution: Cosmopolitan. The species occurs in Canada from coast to coast.

Economic importance: In Canada *D. lardarius* is frequently found in granaries, grain elevators, warehouses, and dwellings, where the adults and larvae survive on all kinds of animal materials and on the remains of insects. They probably also feed on materials of vegetable origin, since Woodroffe (1966) reared the species on a diet of wheat germ. The full-grown larvae are known to bore into solid materials, such as timber, cork, vegetable fibers, lead, and mortar, to pupate. In the United Kingdom *D. lardarius* and *D. maculatus* have recently become serious pests in the poultry industry (Coombs 1978).

Dermestes maculatus De Geer
hide beetle
dermeste des peaux

Diagnosis: Among the *Dermestes* dealt with here, this species is distinctive in having the apical margin of each elytron serrate and the apex spiniform. Otherwise, it is quite similar to *D. frischii*.

Sexual dimorphism: Males have a tuft of setae on the middle of the fourth visible abdominal sternum. Females have no such tuft of setae.

Distribution: Cosmopolitan. In Canada the species ranges from Quebec west to British Columbia.

Economic importance: In Canada this species has been reported in warehouses, where the adults and larvae were probably feeding on the remains of insects. The species is known to feed on all kinds of animal materials, and in the tropics it causes extensive damage to marketed dried fish. In the United Kingdom *D. maculatus* is one of the most

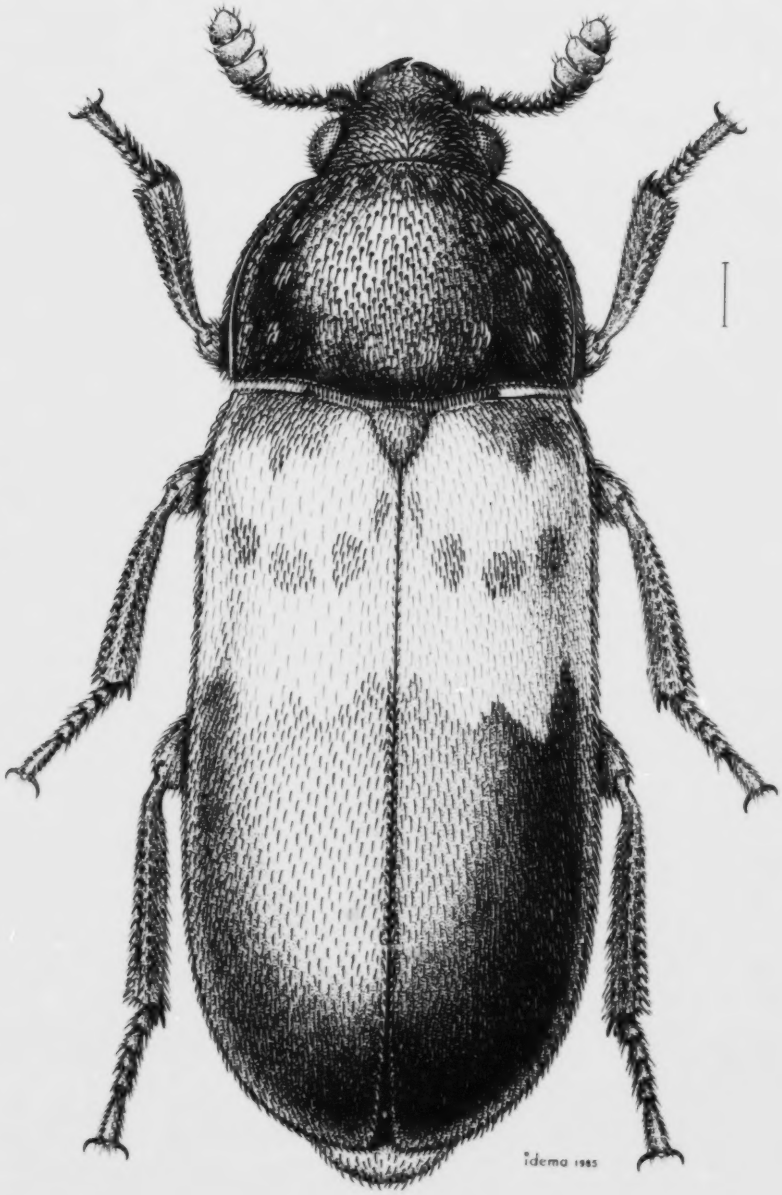

Fig. 196 ***Dermestes lardarius*** **Linnaeus. Scale = 0.5 mm.**

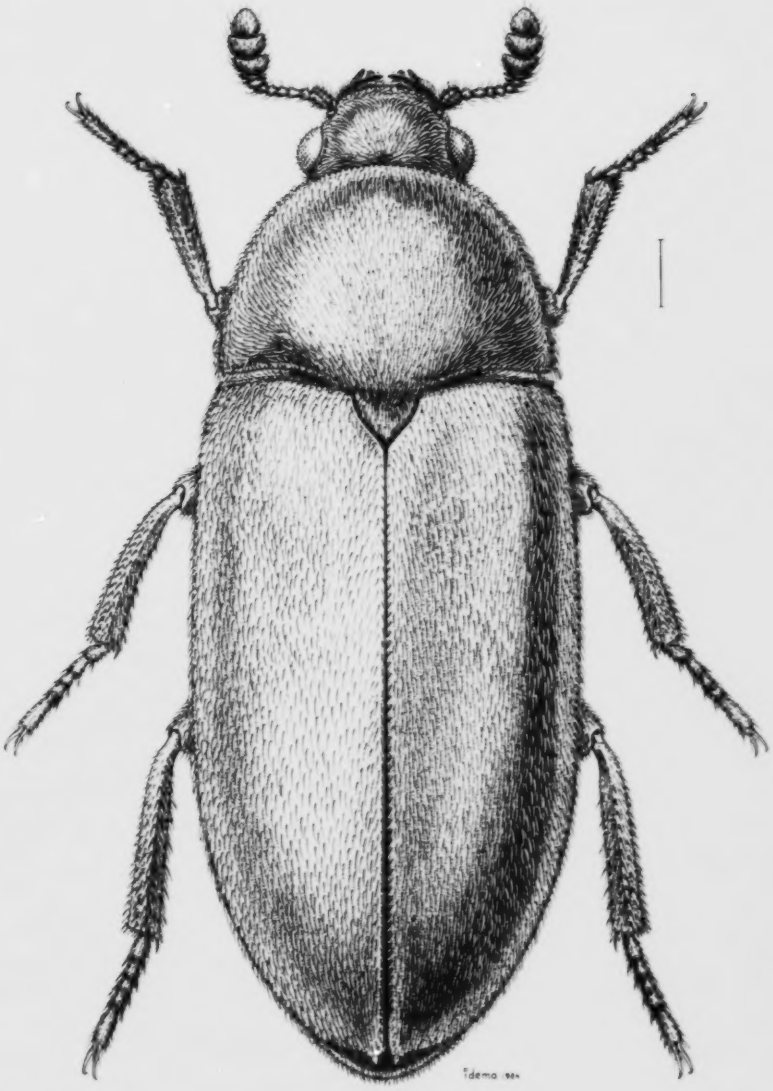

Fig. 197 ***Dermestes maculatus*** **De Geer. Scale = 0.5 mm.**

common beetles in droppings in poultry houses (Armitage 1986). As for the other *Dermestes* discussed here, the damage caused by this beetle is intensified by the fact that full-grown larvae, when they pupate, bore into solid materials on which they cannot feed, such as cork, timber, lead, and vegetable fibers. According to Aitken (1975) this species is the most common *Dermestes* on cargo ships carrying imported goods to Britain.

Dermestes marmoratus Say
common carrion dermestid

Diagnosis: This is the largest species of *Dermestes* dealt with here. The adults are recognizable by the coloration of the elytral vestiture: each elytron is covered with alternating patches of pale brown and black setae, sometimes with patches of white setae also, and the basal half bears a transverse band of white setae narrowed medially.

Sexual dimorphism: Males have a tuft of setae on the middle of the third and fourth visible abdominal sterna (Fig. 261). Females have no such tuft of setae.

Distribution: Exclusively Nearctic. In Canada the species has been found from Manitoba west to British Columbia.

Economic importance: This dermestid has been recorded in Canada from cereal warehouses and from a powdered-milk plant in British Columbia, where it was probably surviving on the remains of insects.

Dermestes signatus LeConte

Diagnosis: The species most closely resembles *D. lardarius* but differs from it in that the apical half of the elytra is covered with golden and black setae. In *D. lardarius* the apical half of the elytra bears only black setae.

Sexual dimorphism: Males have a tuft of setae on the middle of the third and fourth visible abdominal sterna (Fig. 261). Females have no such tuft of setae.

Distribution: Exclusively Nearctic. In Canada the species ranges from Ontario west to British Columbia.

Economic importance: This species is a minor pest in Canada. It has been collected in cereal warehouses, in a powdered-milk plant, and in a broiler barn, where adults and larvae were probably feeding on the remains of insects.

Megatoma variegata (Horn)

Diagnosis: This dermestid is different from the species of *Reesa*, *Attagenus*, and *Trogoderma* in that the antennal cavity of the prothorax is broadly open posteriorly and the elytral vestiture consists of white, golden brown, and black setae producing a distinct pattern.

Sexual dimorphism: Males have the last antennal segment 1.4–1.9 times as long as the 2 preceding segments combined. In females the length of the last segment is subequal to that of the 2 preceding ones combined.

Distribution: Exclusively North American. In Canada the species is known in western Alberta and British Columbia.

Economic importance: Neilson and Arrand (1958) reported this species as an important household pest in British Columbia. It has also been recorded a number of times as a pest of insect collections (Beal 1967). I have seen one specimen collected in a flour mill in British Columbia.

Reesa vespulae (Milliron)

Diagnosis: The species is distinctive among the dermestids included here by the coloration of the elytral integument, which is dark brown anteriorly and along the suture, light brown on the posterior two-thirds, and contrastingly yellowish between these two zones. No other dermestid dealt with in this guide has such a color pattern.

Sexual dimorphism: This species reproduces parthenogenetically (Milliron 1939; Beal 1967), and only females are known.

Distribution: Originally from North America and introduced in Europe and New Zealand (Archibald and Chalmers 1983). In Canada the species probably occurs in all provinces, having been found in Newfoundland, Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia; I also saw one specimen from the Northwest Territories.

Economic importance: Although Adams (1978) reported that *R. vespulae* has become a significant pest in Europe, particularly in museums, it is still of minor importance in North America. The species is known to damage insect and plant collections and is found occasionally in granaries and dwellings, where it probably survives on dead insects. It is also found in natural conditions as a scavenger on dead insects and spiders in wasp nests (Beal 1967).

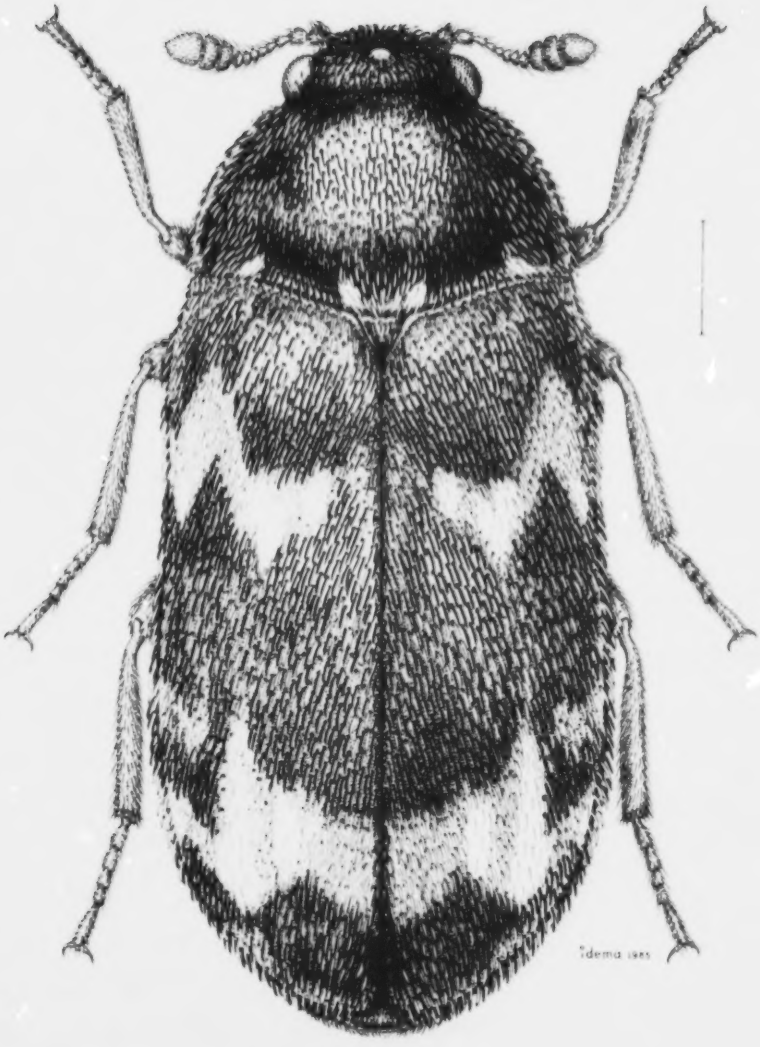

Fig. 198 *Megatoma variegata* (Horn). Scale = 0.5 mm.

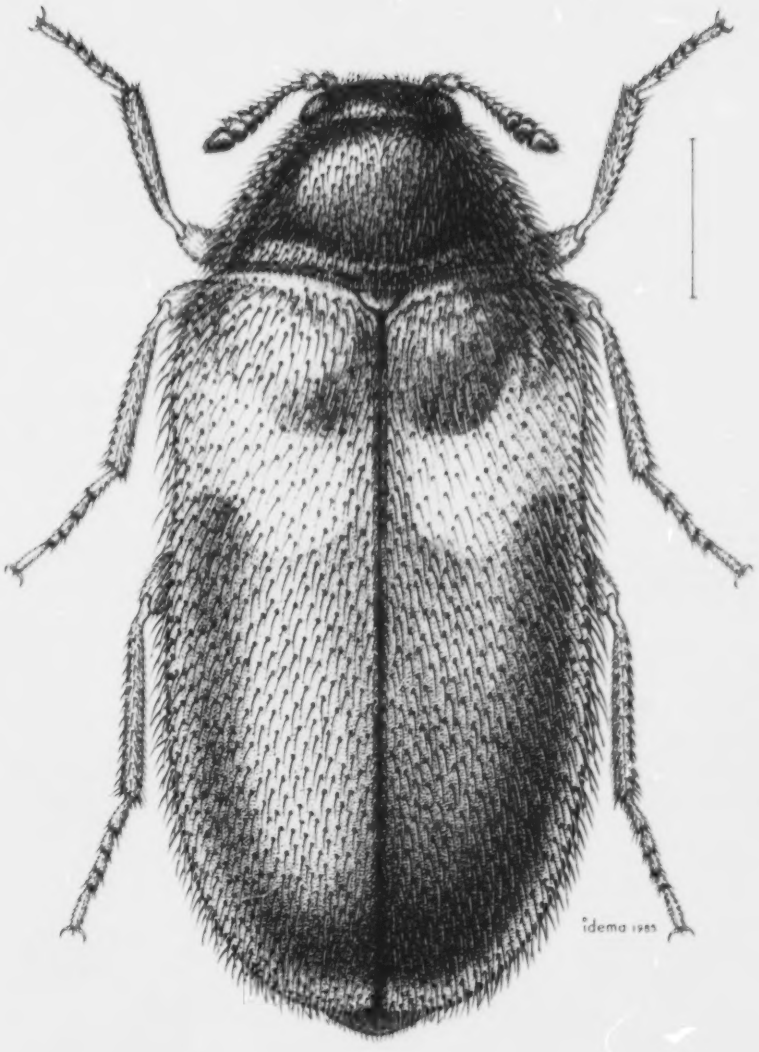

Fig. 199 ***Reesa vespulae*** **(Milliron). Scale = 0.5 mm.**

Thylodrias contractus Motschulsky
odd beetle
thylodrias

Diagnosis: Among the beetles dealt with here, this species is distinctive by its general habitus (Figs. 200 and 201). The males have soft and dehiscent elytra on the posterior half, and the females are larviform.

Sexual dimorphism: The sexes differ by many characters, the most obvious being the absence of elytra in the females.

Distribution: Throughout the Palaearctic region and introduced in North America at the beginning of the 20th century. In Canada the species is known from Quebec west to Alberta and in the Yukon Territory.

Economic importance: In Canada *T. contractus* is a minor pest. It has been found occasionally infesting insect collections. MacNay (1954) reported it damaging paintings in the National Gallery of Canada, where it was apparently feeding on the color pigments. The species has also been found in houses. Both adults and larvae feed on a wide variety of materials, such as wool, silk, clothing, and bedding, but seem to prefer materials of animal origin.

Trogoderma glabrum (Herbst)

Diagnosis: The species differs from the other *Trogoderma* dealt with here in having the elytral integument unicolorous (black) or nearly so (black with a brownish spot on the humerus) and the elytral pubescence bicolorous or tricolorous (brown to black, white, and golden). The other species have the elytral integument bicolorous (black with distinct paler areas) or unicolorous pale (yellowish to reddish brown) or the elytral pubescence unicolorous.

Sexual dimorphism: Males have a 5- to 7-segmented antennal club, females a 4-segmented one.

Distribution: Europe, North America, and Mexico. In Canada the species has been reported in Quebec, Ontario, and the Prairie Provinces.

Economic importance: This species is a minor pest in Canada. It has been found in granaries, flour mills, and occasionally in houses in food. In Kansas White and McGregor (1957) reported important infestations of this *Trogoderma* in stored wheat and corn in the 1950s. The species can live on cereal food alone (Beal 1956).

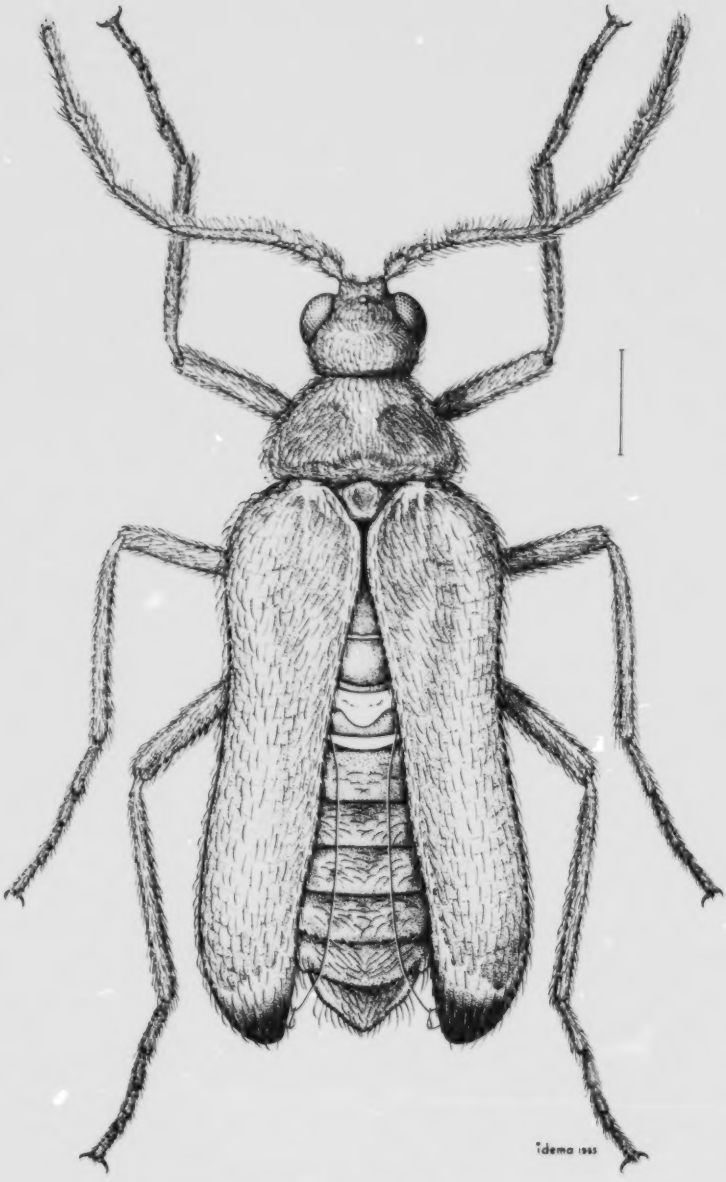

Fig. 200 *Thylodrias contractus* Motschulsky; male. Scale = 0.5 mm.

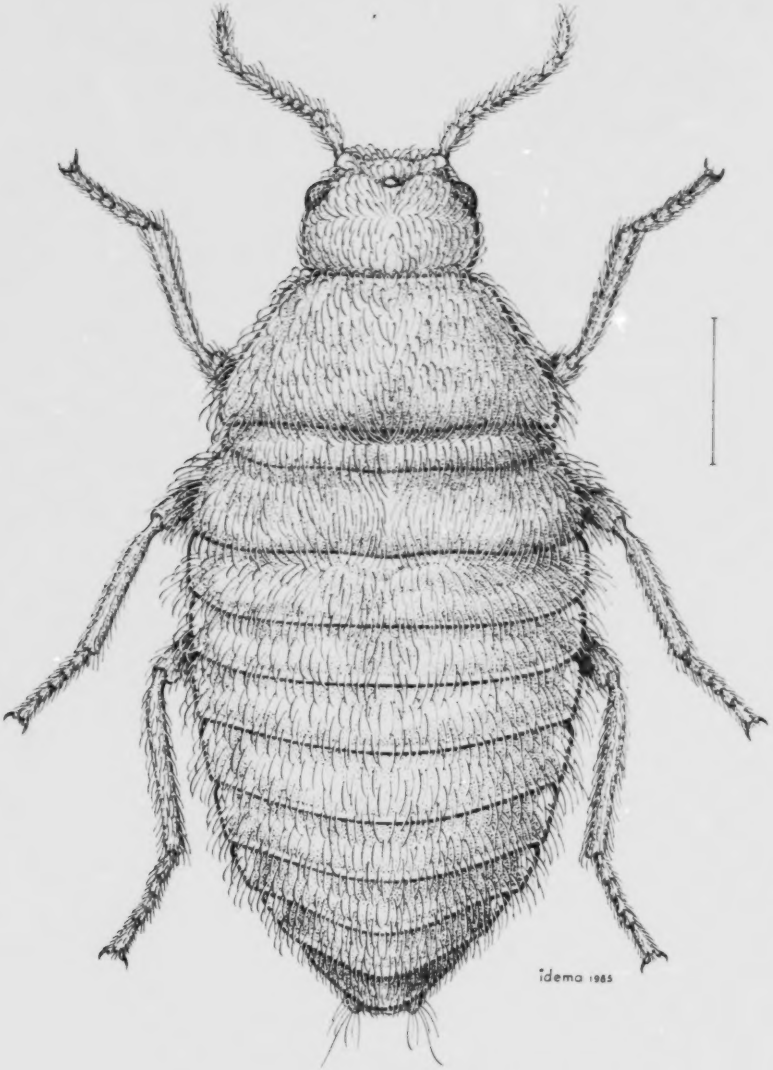

Fig. 201 *Thylodrias contractus* **Motschulsky; female. Scale = 0.5 mm.**

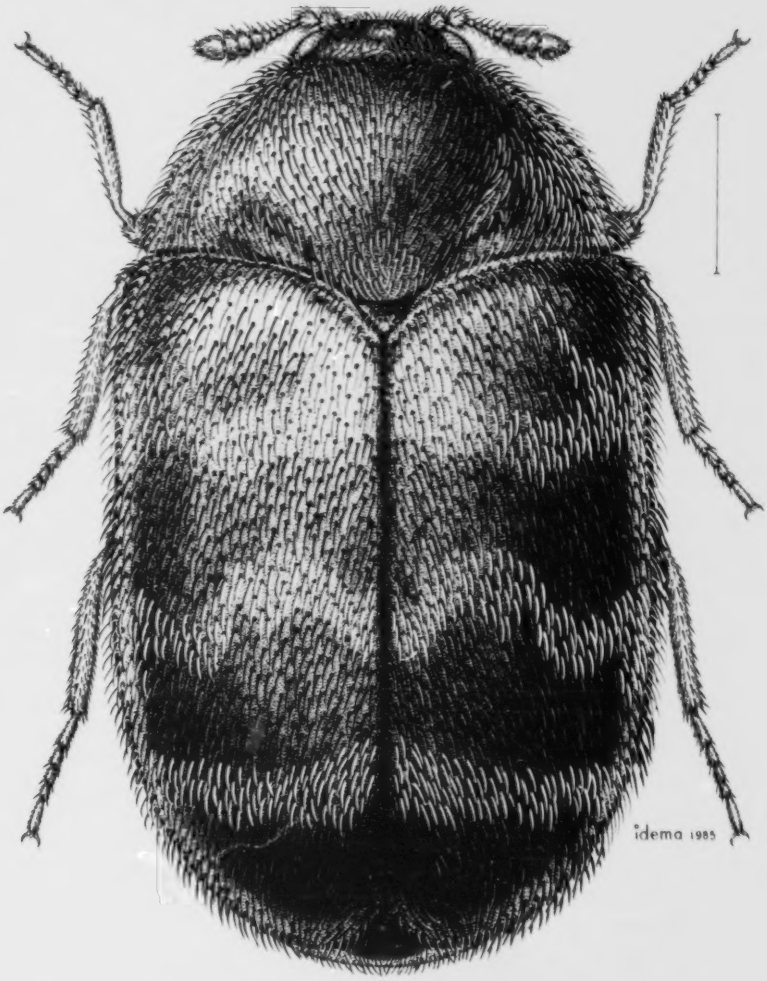

Fig. 202 *Trogoderma glabrum* (Herbst). Scale = 0.5 mm.

Trogoderma granarium Everts
khapra beetle
trogoderme des grains

Diagnosis: The species is distinct from the other *Trogoderma* included here by the coloration of the integument: the elytra are unicolorous, light yellowish brown to dark reddish brown or vaguely mottled, with the pronotum usually distinctly darker than the elytra. The dorsal setae are predominantly pale, yellowish to golden. The other *Trogoderma* have the elytral integument either with a defined color pattern or uniformly piceous to black, with the pronotum not darker than the elytra. In addition, they do not have the dorsal setae predominantly pale.

Sexual dimorphism: Males have a dense fringe of thicker, suberect hair near the apical margin of the last visible sternum; females have the last visible sternum like the preceding one, without a fringe of thicker setae (Fig. 262).

Distribution: Recorded from all zoogeographic regions but known to be endemic in Africa north of the equator, southern Asia, and southeastern Europe. The species is established in heated premises in some northern European countries. Its actual and theoretical distribution has been discussed by Howe (1958, 1963) and Banks (1977). The species is not established in Canada, but it has been intercepted on ships in ports.

Economic importance: This species feeds exclusively on vegetable matter and is one of the most serious pests of stored grain, pulse crops, oilseeds, oil cakes, and cereal products in warm regions of the Old World. In Britain it has been a serious pest of stored malt since 1910. The species is remarkable for its ability to live in hot, dry conditions, which are unsuitable for most other pests. In addition, it can withstand starvation for up to 3 years, survive fumigation and treatment with insecticides, and in a short time, build up large populations in a favorable environment. The species is under strict quarantine in Canada as well as in other countries, such as the United States. I have included it here because of its status as one of the most feared stored-grain pests.

Trogoderma inclusum LeConte
mottled dermestid
trogoderme des denrées

Diagnosis: The species is readily separated from the other *Trogoderma* included here by the medial margin of the eye being distinctly notched. In the other species of the genus dealt with in this guide, the medial margin of the eye is entire to slightly notched.

This species was confused with *T. versicolor* (Creutzer), under the latter name, until Beal (1956) recognized the two species. *Trogoderma versicolor* is exclusively European and apparently not associated with stored products (Aitken 1975).

Sexual dimorphism: Males have a 6- or 7-segmented antennal club, females a 4- or 5-segmented one.

Distribution: North America and the British Isles (Beal 1956); Aitken (1975) added the Mediterranean region. In Canada the species ranges from coast to coast.

Economic importance: In Canada this species is probably the most common *Trogoderma* associated with stored products. It has been found in a wide variety of animal and vegetable products but rarely in sufficient numbers to cause serious damage. The species is regularly encountered in dried-milk factories. According to Strong (1975), it is more likely to occur as an industrial pest, feeding on processed dry foods and animal feed.

Trogoderma sinistrum Fall

Diagnosis: The species is distinctive among the *Trogoderma* included here in having the dorsal pubescence unicolorous, brownish to piceous.

Sexual dimorphism: Males have a 6- or 7-segmented antennal club, females a 4-segmented one.

Distribution: Exclusively North American. In Canada the species has been reported from Quebec west to British Columbia and in the Northwest Territories and the Yukon Territory.

Economic importance: Smith and Barker (1987) recently have found the species to be quite common in granaries throughout the Prairie Provinces.

Trogoderma sternale Jayne

Diagnosis: The species somewhat resembles *T. variabile* but differs mainly in having the basal and submedian bands of each elytron connected by a longitudinal band or bands and the male antennal club serrate.

This species is closely related to *T. ornatum* (Say), which in Canada occurs only in southern Ontario. Adults of the two species differ externally mainly in the size of the male third antennal segment. In *T. sternale* the segment is minute and about half the length and width of the second or fourth segment (Fig. 88); in *T.*

ornatum, the segment is larger and about the same length and width as the second or fourth segment. In addition, the male antennae are more serrate in *T. ornatum* than in *T. sternale*. *Trogoderma ornatum* has not yet been reported as a pest in Canada but has been found in a wide variety of products and is known to infest dried insect collections in the United States.

Sexual dimorphism: Males have a 6- or 7-segmented antennal club, females a 4-segmented one (Fig. 251).

Distribution: Exclusively North American. In Canada the species has been reported only from British Columbia.

Economic importance: The species is a minor pest. It has been recorded in animal and vegetable materials and is known to attack dried insect collections. It also occurs in granaries, where it probably survives on dead insects.

Trogoderma variabile Ballion (synonym: *T. parabile* Beal)
warehouse beetle
trogoderme des entrepôts

Diagnosis: The medial margin of the eye entire and the bicolorous elytral integument distinguish this species from the other *Trogoderma* dealt with here, except *T. sternale*. It differs from *T. sternale*, however, in having the basal and submedian bands of each elytron free, not connected by a longitudinal band or bands, and the male antennal club not serrate.

Sexual dimorphism: Males have a 6- or 7-segmented antennal club, females a 4-segmented one (Fig. 252).

Distribution: Holarctic and found in Europe, Asia, and North America. In Canada the species ranges from New Brunswick west to British Columbia.

Economic importance: The species is a minor pest in Canada, where it has been found in flour and feed mills, warehouses, dwellings, and occasionally in grain samples from granaries. In other regions of the world, it is considered to be a major or potentially serious pest of stored products, particularly seeds, cereals, legumes, nuts, and other high-protein food.

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ENDOMYCHIDAE handsome fungus beetles

This family includes 10 species in Canada. Their members are usually found under bark and in fungi, rotten wood, leaf litter, and decaying fruits. They feed on fungi.

In Canada only one species is found associated with stored products.

Mycetaea subterranea (Fabricius) (synonym: *M. hirta* Marsham)

Diagnosis: The species is distinctive among the Coleoptera dealt with here by its general habitus (Fig. 203), particularly the unequal pubescence of the elytra and the presence of a sublateral carina on each side of the pronotum.

Sexual dimorphism: The sexes are externally similar.

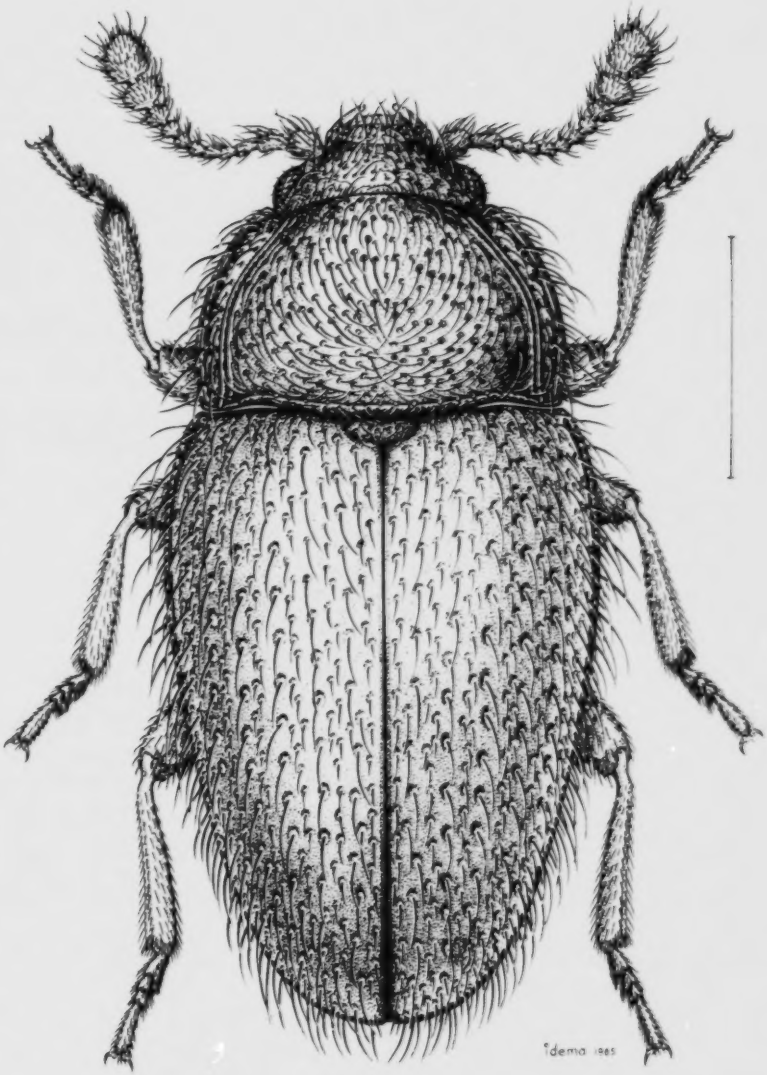

Fig. 203 ***Mycetaea subterranea*** **(Fabricius). Scale = 0.5 mm.**

Distribution: Recorded in the northern hemisphere and a few countries in the tropics; possibly established in New Zealand (Archibald and Chalmers 1983). In Canada the species has been collected from Newfoundland to Ontario and in British Columbia.

Economic importance: This species is occasionally associated with stored products in granaries, mills, warehouses, and cellars. It has no direct effect on the products because it feeds on fungi; its presence usually indicates that the products are moldy. The species has also been found in old tree trunks, caves, and beehives.

HISTERIDAE hister beetles

This group of beetles includes approximately 100 species in Canada. They are found mostly under the bark of dead trees and in decaying vegetable matter, carrion, dung, bird nests, and mammal nests. Both adults and larvae are carnivorous.

Two species of histerids in Canada are more or less frequently associated with rotten grain in granaries. They have no direct effect on the grain, as they feed mainly on insects and mites. In addition to the species included here, two species of *Dendrophilus*, *D. xavieri* Marseul and *D. punctatus* (Herbst), are found occasionally in granaries and flour mills in Canada. Both species are probably introduced, the first one from Japan, the second from Europe.

Carcinops pumilio (Erichson)

Diagnosis: The species is distinct from *Gnathoncus nanus*, the other histerid dealt with here, in having the last exposed tergum about the same length as the preceding one and by the presence of an anterior lobe on the prosternum.

Sexual dimorphism: Sexes are externally similar.

Distribution: Cosmopolitan but apparently more characteristic of temperate regions. In Canada the species ranges from Quebec west to British Columbia.

Economic importance: The species has been recorded from Canadian cargo ships carrying wheat (Aitken 1975). Armitage (1986) reported it as one of the most conspicuous and abundant species in samples of droppings in poultry houses in the United Kingdom. Geden and Stoffolano (1987) mentioned it as one of the main predators of immature house flies in Massachusetts poultry houses.

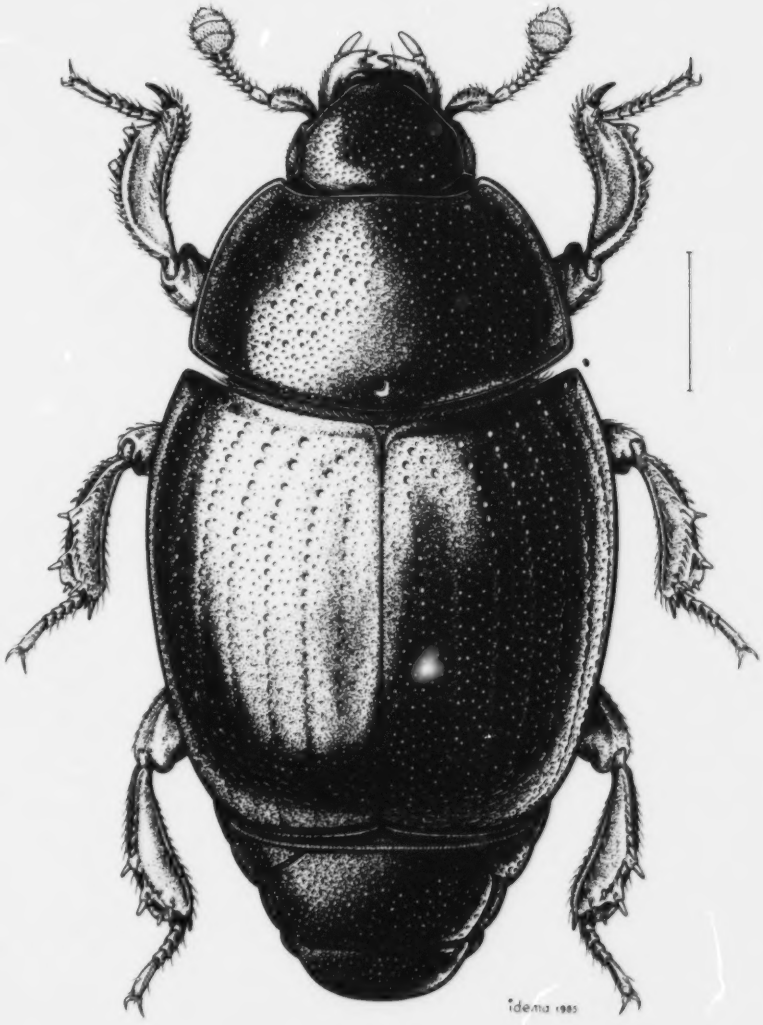

Fig. 204 *Carcinops pumilio* (Erichson). Scale = 0.5 mm.

Gnathoncus nanus (Scriba)

Diagnosis: The species differs from *Carcinops pumilio* mainly in having the last exposed tergum distinctly longer than the previous one and by the absence of an anterior lobe on the prosternum.

This species is similar to *G. communis* Marseul, another North American histerid occasionally associated with stored food products. Adults of *G. communis* differ from those of *G. nanus* usually by their larger size (length 2.5–3.5 mm), and by having the apical fourth of the elytra with faint microsculpture and denser, more or less contiguous punctation. In *G. nanus* the elytral apex has no microsculpture, and the punctation is sparser and clearly separated. Geden and Stoffolano (1987) mentioned it as one of the main predators of immature house flies in Massachusetts poultry houses.

Sexual dimorphism: Males have broad flat setae underneath the four basal segments of the fore tarsi (Fig. 263) and the metasternum feebly concave. Females have no such setae on the fore tarsi (Fig. 263), and the metasternum is feebly convex.

Distribution: Exclusively North American. In Canada the species has been reported from Quebec west to British Columbia.

Economic importance: As discussed for the family.

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HYDROPHILIDAE water scavenger beetles

This family is represented in Canada by about 200 species. Many of them are aquatic or semiaquatic, but some live among decaying leaves, in mammal dung, and in the soil. Adults of most species feed on fungi, decomposing vegetable matter, dung, and dead animal tissue. The larvae are carnivorous and cannibalistic.

Hydrophilids are incidental in stored products and of no economic importance.

LATHRIDIIDAE minute brown scavenger beetles

This family of small beetles includes about 50 species in Canada. Their members are found in or under the following: logs; the bark of dead trees; foliage; rotten wood; fungi; nests of birds, mammals, and Hymenoptera; and stored products. Adults and larvae feed exclusively on fungi, particularly molds.

A number of lathridiids are found quite frequently in stored products. They do not cause direct injury to the products, as they feed exclusively on fungi. Their presence is an indication that the substance is damp and moldy.

Aridius nodifer (Westwood)

Diagnosis: The species is distinctive among the lathridiids included here in having the elytra wavy (Fig. 205). This particularity is caused by the transverse, shallow depressions on the elytra and a longitudinal swelling on the apical third of the third interval; in addition, the fifth interval is strongly carinate on the basal three-fourths of the elytra.

Sexual dimorphism: Males differ from females by a number of characteristics, the most conspicuous being the presence of a pair of median, setose protuberances on the posterior edge of the metasternum (Fig. 264).

Distribution: Cosmopolitan. In Canada the species probably occurs throughout the temperate regions.

Economic importance: As mentioned for the family. The species was recorded in Canadian cargo ships carrying wheat (Aitken 1975).

Cartodere constricta (Gyllenhal)
plaster beetle

Diagnosis: Among the lathridiids dealt with here, *C. constricta* is quite different in having a 2-segmented antennal club and the pronotum strongly constricted at basal third. The only other species of the family included here with a 2-segmented club is *Dienerella filum*,

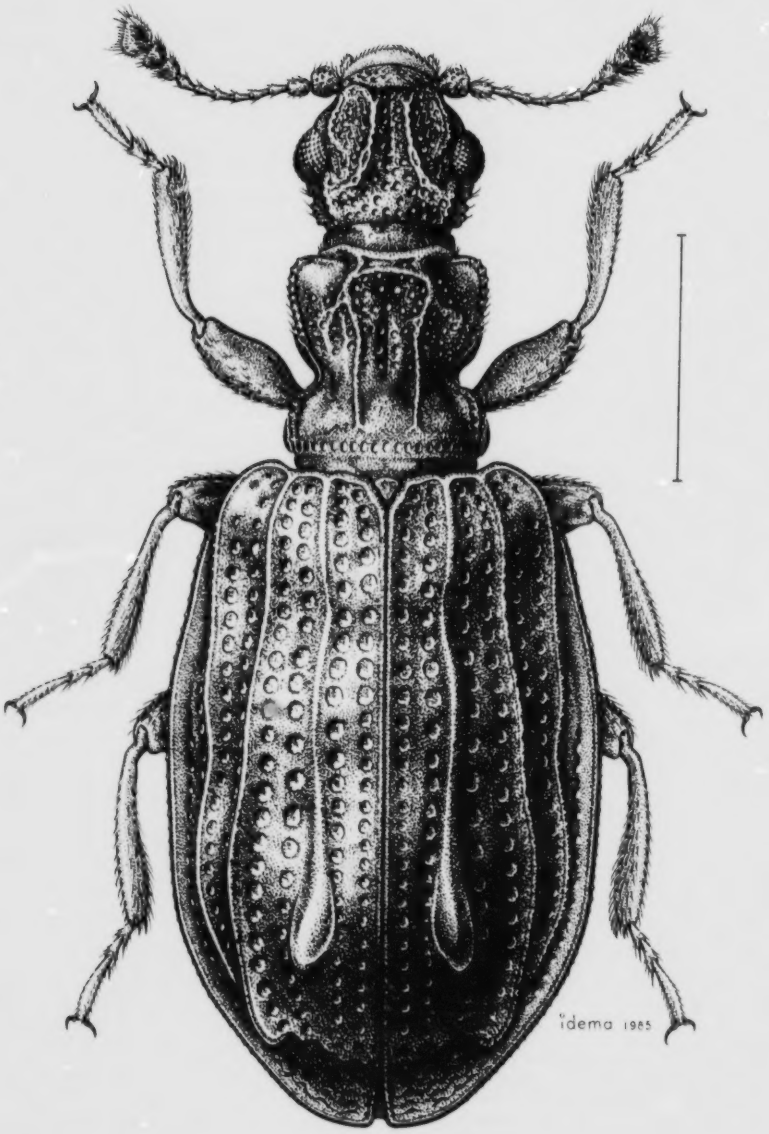

Fig. 205 ***Aridius nodifer*** **(Westwood). Scale = 0.5 mm.**

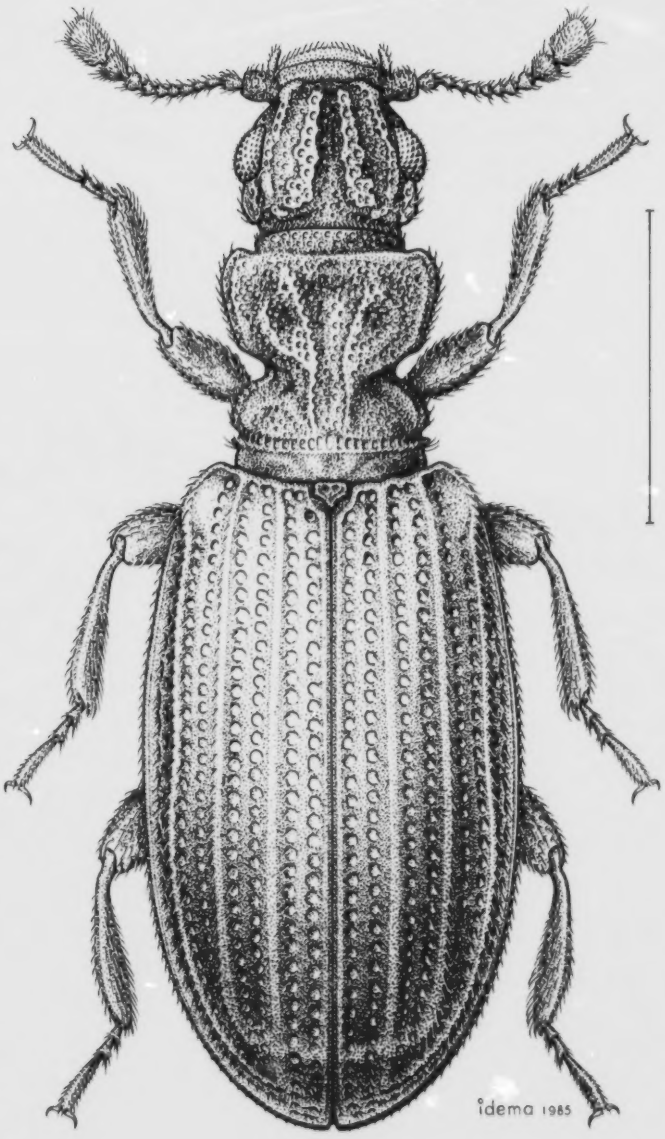

Fig. 206 *Cartodere constricta* (Gyllenhal). **Scale = 0.5 mm.**

but this species differs in having the sides of the pronotum sinuate at basal third, no longitudinal ridges on the pronotum, and the temples absent.

Sexual dimorphism: Sexes are externally similar.

Distribution: Cosmopolitan. In Canada the species probably occurs from coast to coast in the temperate regions.

Economic importance: As stated for the family. Aitken (1975) recorded the species, under the name *Cartodere* species near *constricta*, in Canadian cargo ships carrying wheat.

Corticaria Marshall

Diagnosis: Because of the distinct elytral pubescence, members of *Corticaria* occurring in Canada can be confused, among the lathridiids included here, only with those of *Melanophthalma* and *Corticarina*. They differ from *Melanophthalma* by their general habitus (Fig. 207), particularly the more or less distinct circular impression near the base of the pronotum, and by the absence of coxal lines on the first visible abdominal sternum. Adults of *Corticaria* differ from those of *Corticarina* mainly in having 5 visible abdominal sterna and the first segment of the hind tarsi not produced ventrally.

Twelve species of *Corticaria* have been recorded in Canada, and those most likely to be found in stored products are *C. elongata* (Gyllenhal), *C. fenestralis* (Linnaeus), *C. serrata* (Paykull), and *C. pubescens* (Gyllenhal). The first three species listed have been reported by Aitken (1975) in Canadian cargo ships carrying wheat and barley. The North American species of this genus are in need of a taxonomic revision.

Economic importance: As stated for the family.

Corticarina Reitter

Diagnosis: Adults of *Corticarina* occurring in Canada are rather superficially similar to those of *Corticaria* but differ mainly in having 6 visible abdominal sterna and the first segment of the hind tarsi strongly produced ventrally.

The genus includes four or five species in Canada, the most common ones being *C. fuscula* (Gyllenhal) (= *C. americana* auct. amer.) and *C. cavicollis* (Mannerheim). The latter species is commonly found in granaries in the Prairie Provinces. The North American species of *Corticarina* are in need of a taxonomic revision.

Economic importance: As mentioned for the family.

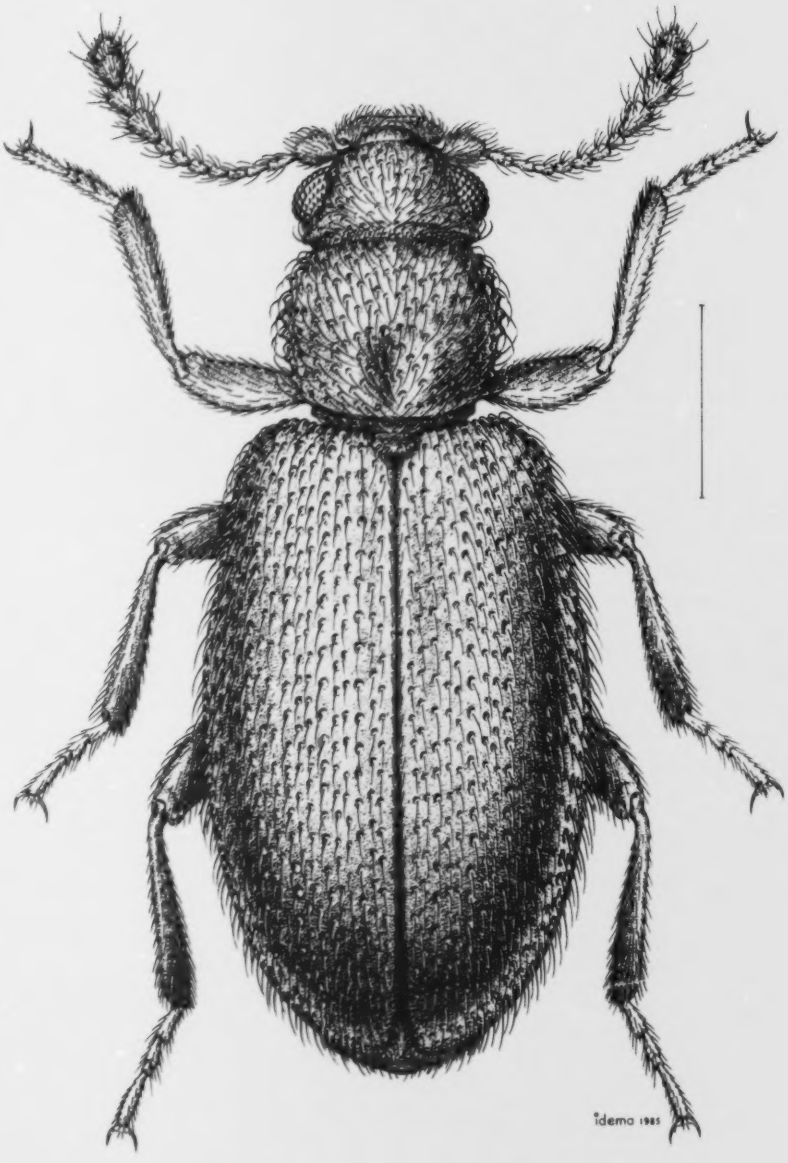

Fig. 207 ***Corticaria pubescens*** **(Gyllenhal). Scale = 0.5 mm.**

Dienerella arga (Reitter)

Diagnosis: The species differs from the other *Dienerella* with a 3-segmented antennal club by the large eyes, which occupy the hind angles of the head so that the temples are absent. In the other species of the genus dealt with here, except *D. filum*, whose adults have a 2-segmented antennal club, the eyes are smaller and the temples distinct.

Sexual dimorphism: Sexes are externally similar.

Distribution: Known in Europe, North Africa, and North America. In Canada the species has been found only in Quebec and Ontario.

Economic importance: As stated for the family.

Dienerella costulata (Reitter)

Diagnosis: This species and *D. filiformis* are readily distinguished from the other species of *Dienerella* dealt with here by the very small eyes, which consist each of only 4 or 5 facets. Adults of *D. costulata* differ from those of *D. filiformis* mainly in having the third, fifth, and seventh elytral intervals slightly carinate and by the presence of 8 rows of punctures on the posterior half of each elytron.

Sexual dimorphism: Sexes are externally similar.

Distribution: Reported in Europe, Japan, and North America. In Canada the species has been collected in New Brunswick, Quebec, Ontario, and Manitoba.

Economic importance: As discussed for the family.

Dienerella filiformis (Gyllenhal)

Diagnosis: The species is superficially similar to *D. costulata* but differs mainly in having the third, fifth, and seventh elytral intervals flat and 7 rows of punctures on the posterior half of each elytron, the fifth and sixth being coalescent near the middle.

Sexual dimorphism: Sexes are externally similar.

Distribution: Recorded in Europe, Japan, and North America; possibly established in New Zealand (Archibald and Chalmers 1983). In Canada the species has been collected in Prince Edward Island, New Brunswick, Manitoba, Saskatchewan, and Alberta.

Economic importance: As stated for the family. *Dienerella filiformis* appears to be the most common species of *Dienerella* in granaries and grain elevators in the Prairie Provinces.

Dienerella filum (Aubé)

Diagnosis: The species differs from the other *Dienerella* included here in having a 2-segmented antennal club, the head with a median, longitudinal impression and the pronotum with a broad, median, oval depression on the anterior half.

Sexual dimorphism: Sexes are externally similar.

Distribution: Reported in Europe, North Africa, and the New World. In Canada the species occurs in the temperate regions from Quebec west to British Columbia.

Economic importance: As stated for the family. The species has recently been reported as a potential pest of air-conditioning and refrigeration systems (Carlton 1988).

Dienerella ruficollis (Marsham)

Diagnosis: Among the species of *Dienerella* occurring in Canada, *D. ruficollis* is distinctive in having the pronotum constricted on the basal third. In this species the eyes are small but each consists of about 20 facets, and the sides of the pronotum are often covered with a grayish waxy exudate.

Sexual dimorphism: Sexes are externally similar.

Distribution: Reported in Europe, North America, and Central America; possibly established in New Zealand (Archibald and Chalmers 1983). In Canada the species has been recorded in Newfoundland, Nova Scotia, Prince Edward Island, Quebec, Ontario, and British Columbia.

Economic importance: As mentioned for the family.

Enicmus fictus Fall

Diagnosis: The two species of *Enicmus* dealt with here are easily separated from the other lathridiids with no distinct elytral pubescence by the more-or-less rounded lateral margins of the pronotum and the keeled intercoxal process of the prosternum. Adults

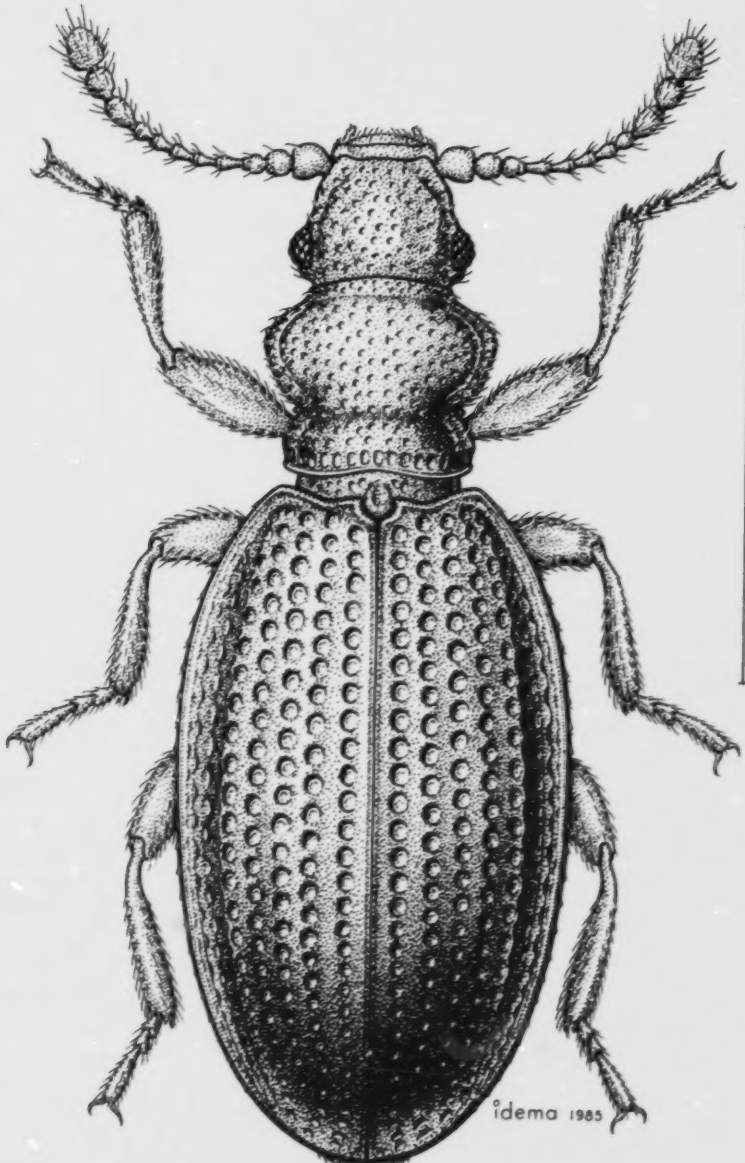

Fig. 208 ***Dienerella ruficollis*** **(Marsham). Scale = 0.5 mm.**

of *E. fictus* differ from those of *E. mimus* in having the metasternum impunctate and the first abdominal sternum with longitudinal rugae on the anterior half.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American. In Canada the species is known from Quebec west to British Columbia and in the Northwest Territories.

Economic importance: As stated for the family.

Enicmus mimus Fall

Diagnosis: The species differs from *E. fictus* mainly in having the metasternum and the first abdominal sternum punctate and without rugae.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American. In Canada the species is known from Manitoba west to British Columbia and in the Northwest Territories.

Economic importance: As stated for the family. This species is relatively common in granaries in Saskatchewan (Smith and Barker 1987).

Lathridius minutus (Linnaeus)
squarenosed fungus beetle

Diagnosis: Among the lathridiids discussed here, *L. minutus* is most similar to *Thes bergrothi* but differs mainly by the presence of only 2 rows of punctures between the seventh interval and the lateral margin of the elytron.

Sexual dimorphism: Sexes are externally similar.

Distribution: Cosmopolitan. In Canada the species ranges from Nova Scotia west to British Columbia.

Economic importance: As mentioned for the family. This species is the most common lathridiid associated with stored products. It has been recorded by Aitken (1975) on Canadian cargo ships carrying wheat, flour, and linseed meal.

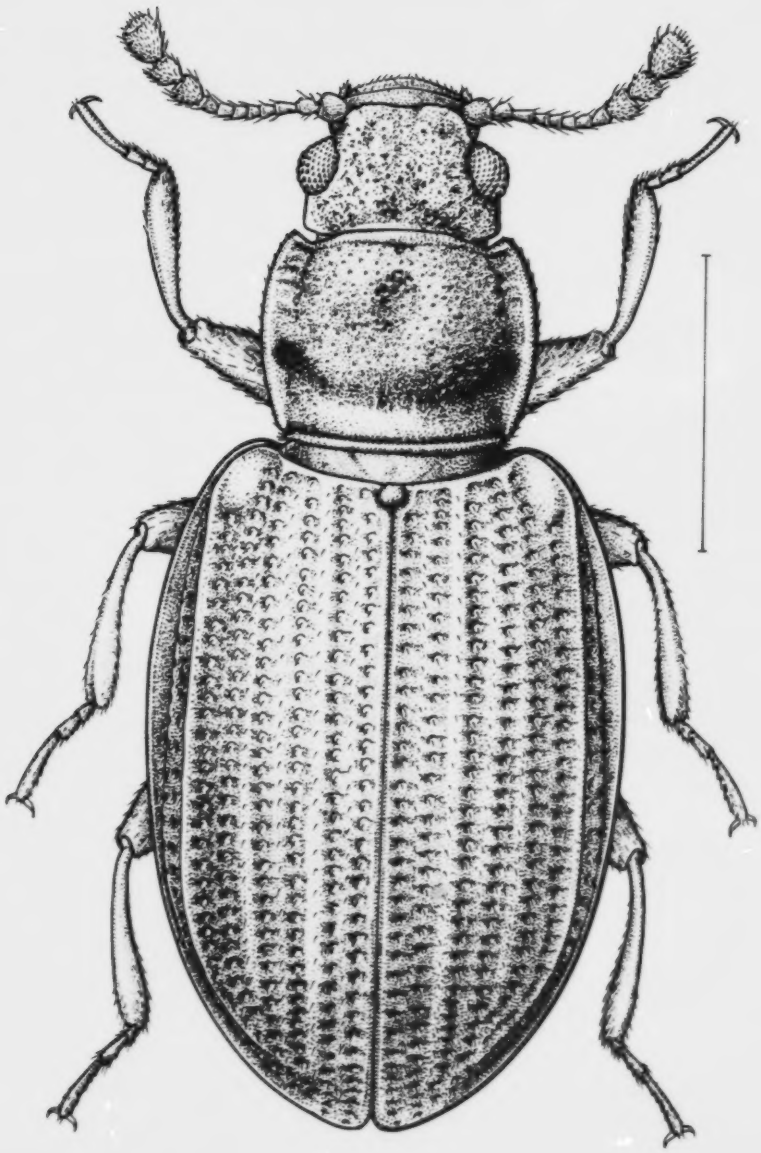

Fig. 209 *Enicmus fictus* **Fall. Scale = 0.5 mm.**

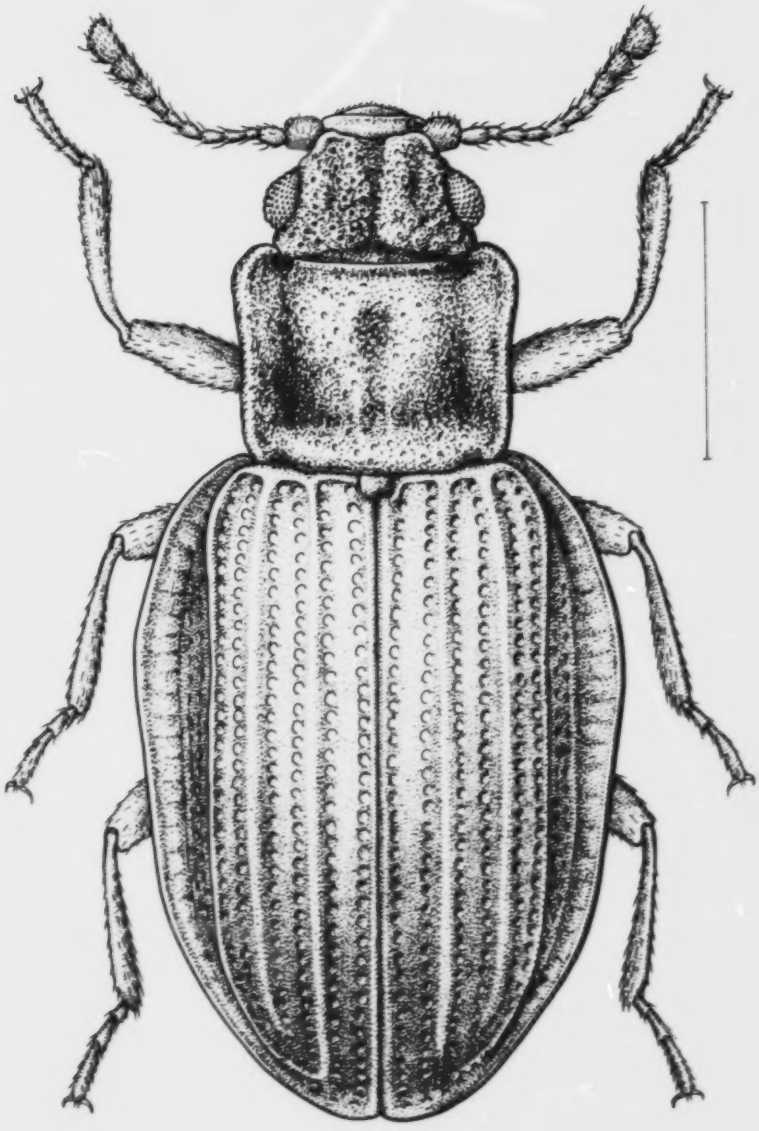

Fig. 210 ***Lathridius minutus*** **(Linnaeus). Scale = 0.5 mm.**

Melanophthalma Motschulsky

Diagnosis: Members of *Melanophthalma* occurring in Canada are easily distinguished from those of other lathridiids dealt with here by their general habitus (Fig. 211), particularly the transverse impression at the base of the pronotum that extends to the lateral margins, and by the presence of coxal lines on the first abdominal sternum.

The genus includes three or four species in Canada, the most common one being *M. americana* (Mannerheim) (= *M. distinguenda* auct. amer.). The North American species of this group are in need of a taxonomic revision.

Superficially, adults of *Melanophthalma* are similar to those of *Cortinicara gibbosa* (Herbst), a species widely distributed throughout the temperate regions of Canada, in the United States, and in the Palaearctic and Oriental regions. Members of *C. gibbosa* differ from those of *Melanophthalma* by the absence of coxal lines on the first abdominal sternum and by the second segment of the hind tarsi, which is shorter than the first one. In members of *Melanophthalma* the second segment of the hind tarsi is as long as or slightly longer than the first. The species has not yet been reported from stored foods but considering its wide distribution and habits, it probably does occasionally occur in stored products.

Economic importance: As stated for the family.

Thes bergrothi (Reitter)
ridgewinged fungus beetle

Diagnosis: The species differs from the other lathridiids discussed here with no distinct elytral pubescence in having 4 rows of punctures, instead of 2, on the apical half of each elytron between the seventh interval and the lateral margin.

Sexual dimorphism: Sexes are externally similar.

Distribution: Reported in Europe, Greenland, and North America. In Canada only a few specimens of *T. bergrothi* have been collected in Saskatchewan, Manitoba, and in the Maritime Provinces.

Economic importance: As stated for the family.

Selected references

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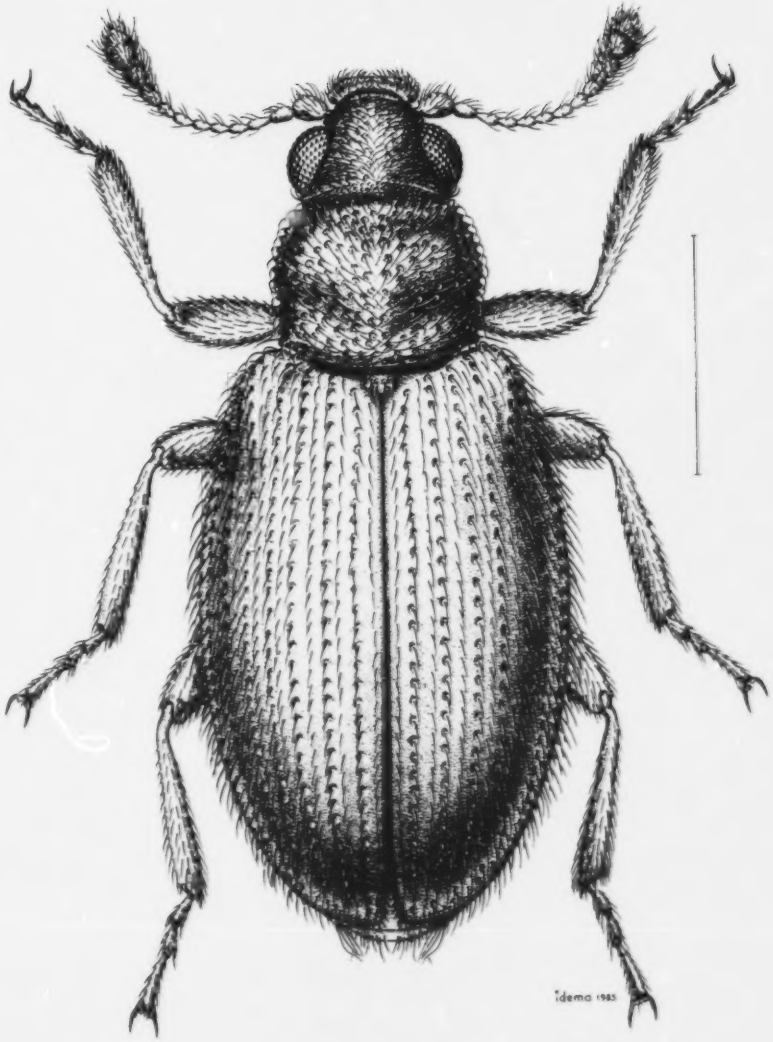

Fig. 211 ***Melanophthalma americana*** **(Mannerheim). Scale = 0.5 mm.**

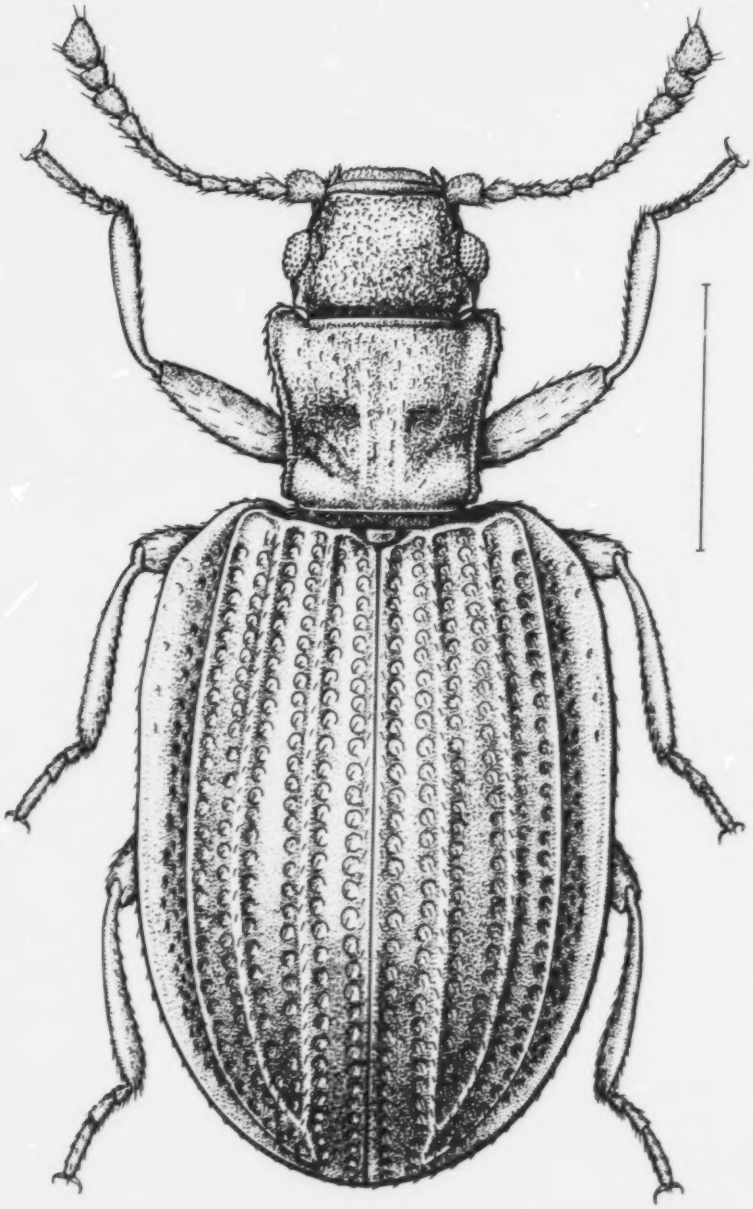

Fig. 212 *Thes bergrothi* (Reitter). Scale = 0.5 mm.

Walkley, L.M. 1952. Revision of the Lathridiini of the State of Washington (Coleoptera, Lathridiidae). Proc. Entomol. Soc. Wash. 54:217–235.

MYCETOPHAGIDAE hairy fungus beetles

In Canada this family of small beetles is represented by about 10 species. Adults and larvae are most commonly found under bark and in fungi, haystacks, and moldy vegetable matter; they apparently feed on fungi.

Three species of mycetophagids are associated with stored products in Canada. They are not serious pests, and their presence is usually indicative of poor storage conditions and moldy produce.

Litargus balteatus LeConte

Diagnosis: The species differs from the two other mycetophagids included here by its small size (length less than 2.3 mm) and in having the last antennal segment about as long as the 2 preceding ones combined and the elytral pubescence without setae arranged in rows.

Sexual dimorphism: Males have 3-segmented fore tarsi, females 4-segmented ones (Fig. 256).

Distribution: Cosmopolitan and probably of North American origin (Hinton 1945). In Canada the species occurs in Quebec and Ontario.

Economic importance: The species has been reported occasionally from grain elevators, mills, warehouses, and dwellings. Of the three mycetophagids associated with stored products in Canada, it is the least common. The species has been recorded by Aitken (1975) on Canadian cargo ships carrying wheat.

Mycetophagus quadriguttatus Müller
spotted hairy fungus beetle

Diagnosis: This mycetophagid differs from the two other species of the family dealt with here in having a 4-segmented antennal club and a pair of deep, oval pits near the base of the pronotum. Like *Litargus balteatus*, members of this species have a bicolorous elytral integument.

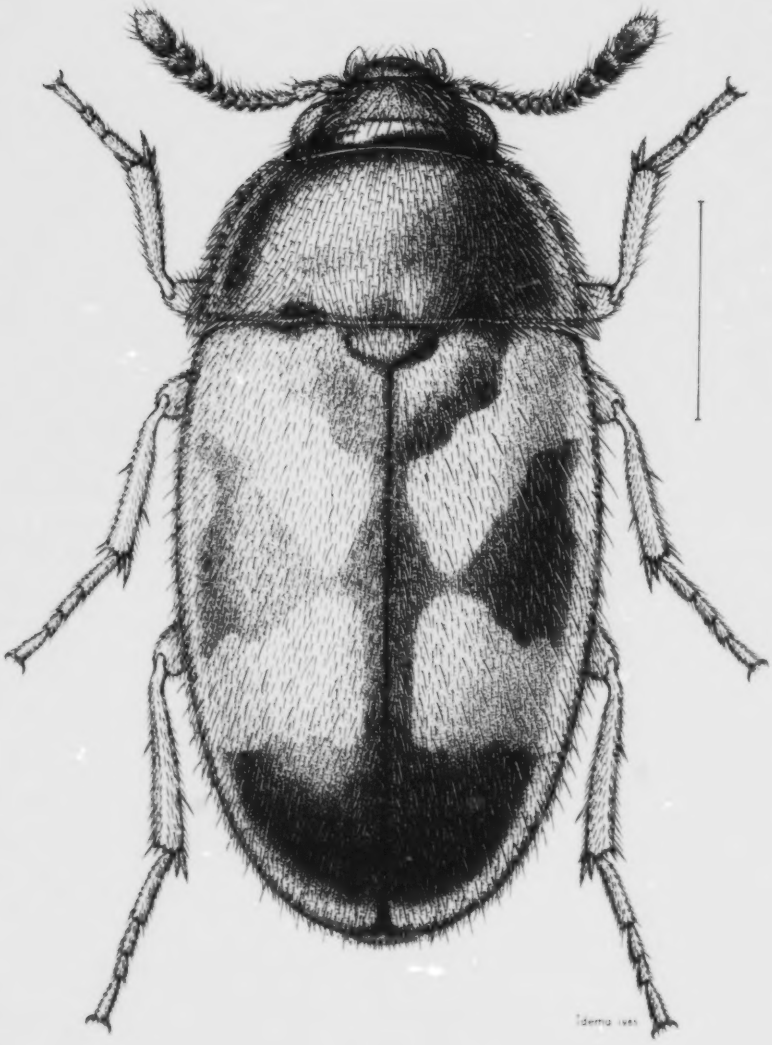

Fig. 213 *Litargus balteatus* LeConte. Scale = 0.5 mm.

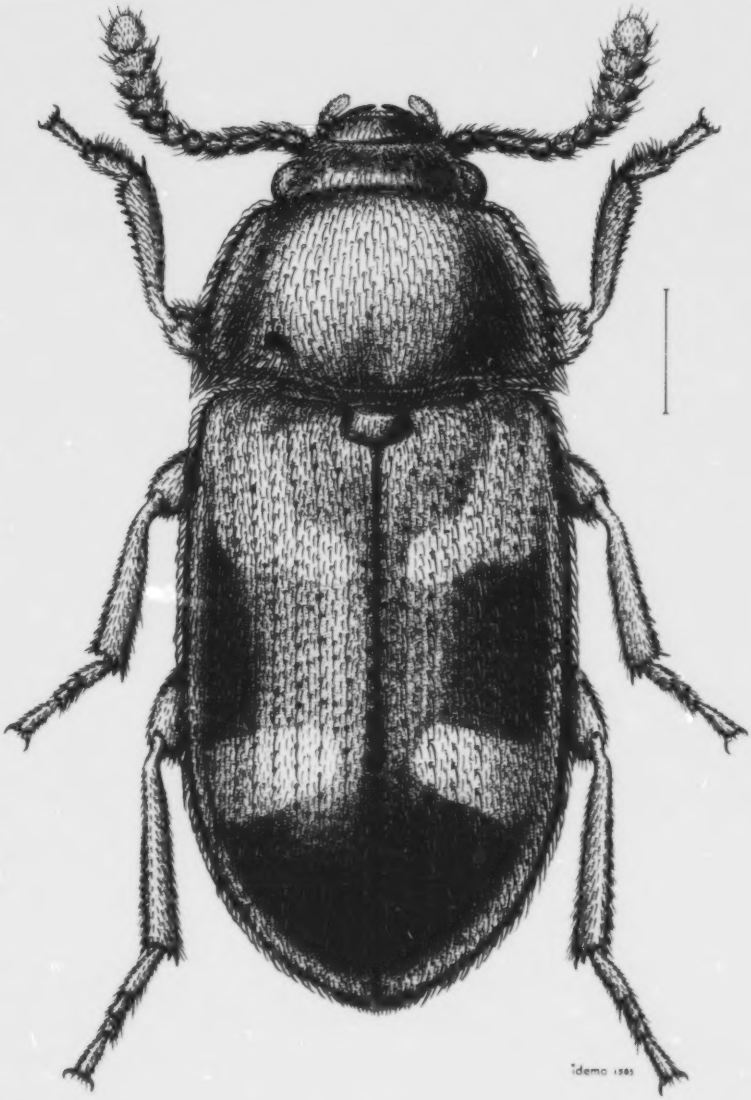

Fig. 214 *Mycetophagus quadriguttatus* Müller. Scale = 0.5 mm.

Sexual dimorphism: Males have 3-segmented fore tarsi, with the first segment dilated and densely pubescent on the ventral side; females have 4-segmented fore tarsi and the first segment neither dilated nor pubescent ventrally (Fig. 265).

Distribution: Europe and North America. In Canada the species is found in the temperate regions from New Brunswick west to British Columbia.

Economic importance: Members of this species have been reported in grain elevators, granaries, mills, and warehouses. They are fairly common in the Prairie Provinces.

Typhaea stercorea (Linnaeus)
hairy fungus beetle
mycétophage des céréales

Diagnosis: The species is readily separated from the two other Mycetophagidae included here by its unicolorous reddish brown elytral integument. The other two mycetophagids have a bicolorous elytral integument. This species resembles, to some extent, the anobiids discussed in this guide. It differs from them, however, in having the head clearly visible from above, a symmetrical antennal club, and 3- (fore tarsi of the male) or 4-segmented tarsi. Members of *Lasioderma serricorne* and *Stegobium paniceum* have the head concealed from above by the hood-like pronotum, the antennal club absent or asymmetrical, and 5-segmented tarsi.

Sexual dimorphism: Males have 3-segmented fore tarsi, females 4-segmented ones (Fig. 256).

Distribution: Cosmopolitan. In Canada the species occurs throughout the temperate regions.

Economic importance: This species is the most common of the three mycetophagids associated with stored products in Canada. It has been found in granaries, barns, mills, stores, warehouses, and dwellings. Serious infestations in dairy barns have been reported (Campbell et. al. 1989). It is also found in cornfields, where it is apparently attracted to decaying kernels on exposed ears.

Selected reference

Parsons, C.T. 1975. Revision of Nearctic Mycetophagidae (Coleoptera). Coleopt. Bull. 29:93–108.

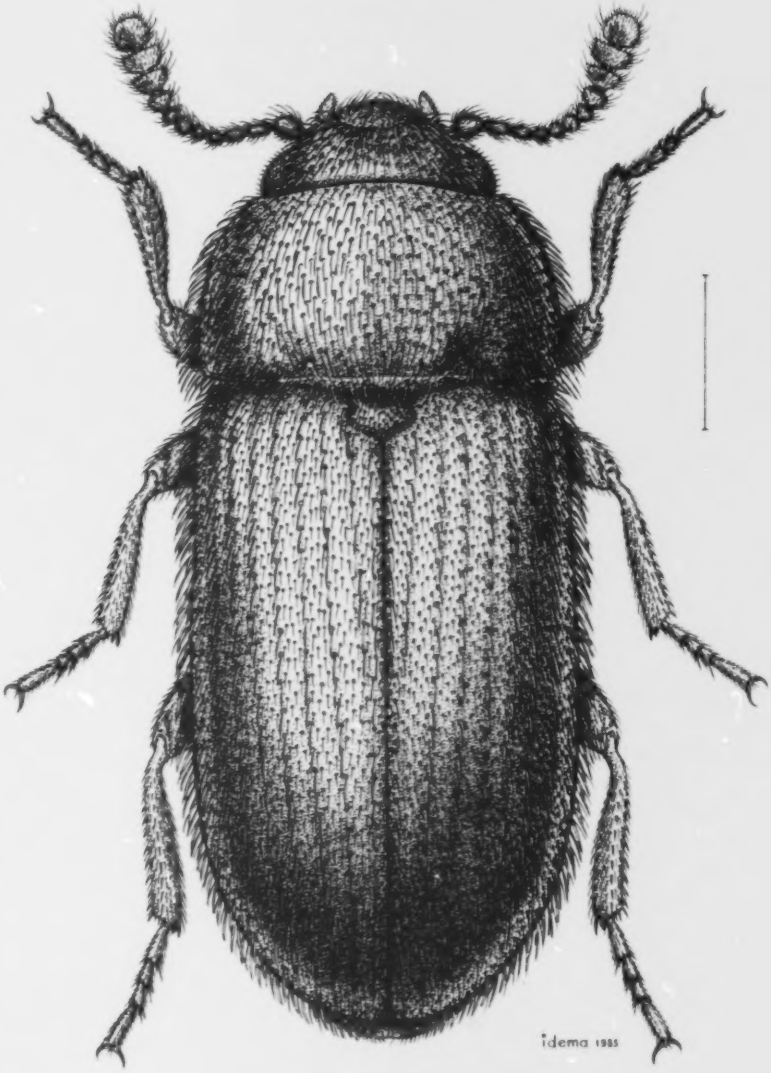

Fig. 215 ***Typhaea stercorea*** **(Linnaeus). Scale = 0.5 mm.**

NITIDULIDAE sap beetles

Approximately 100 species of nitidulids occur in Canada. They are most commonly found on fruit, carrion, fungi, trees, and flowers. Adults and larvae feed on the sap of trees, the juice of fruits, decaying fungi, and carrion.

The few species of sap beetles associated with stored products in Canada are not economically important, but some are serious pests in the field. The corn sap beetle, *Carpophilus dimidiatus* (Fabricius), has been reported occasionally in Canada in imported food products. The species, however, is not established here. It occurs throughout the tropical and warm temperate regions of the world (Aitken 1975).

Carpophilus brachypterus (Say)

Diagnosis: The species differs from the other nitidulids dealt with here in having 2 exposed terga with uniformly dark elytra.

Sexual dimorphism: Males have the sixth abdominal sternum exposed and the apical margin of the fifth sternum deeply emarginate; females have the sixth sternum concealed and the apical margin of the fifth sternum truncate (Fig. 253).

Distribution: Exclusively North American. In Canada the species is found in Quebec, Ontario, and Manitoba.

Economic importance: In recent years adults of this species have been found in wheat granaries in many localities of Manitoba (L.B. Smith, personal communication).

Carpophilus hemipterus (Linnaeus)
driedfruit beetle
nitidule des fruits

Diagnosis: The species is distinct from the other species of the family included here in having 2 exposed terga with yellowish spots on the elytra.

Sexual dimorphism: Males have the sixth abdominal sternum exposed and the apical margin of the preceding one deeply emarginate; females have the sixth abdominal sternum concealed and the apical margin of the preceding one truncate (Fig. 253).

Distribution: Throughout the temperate and warm regions. In Canada the species has been reported in Quebec, Ontario, Manitoba, and British Columbia.

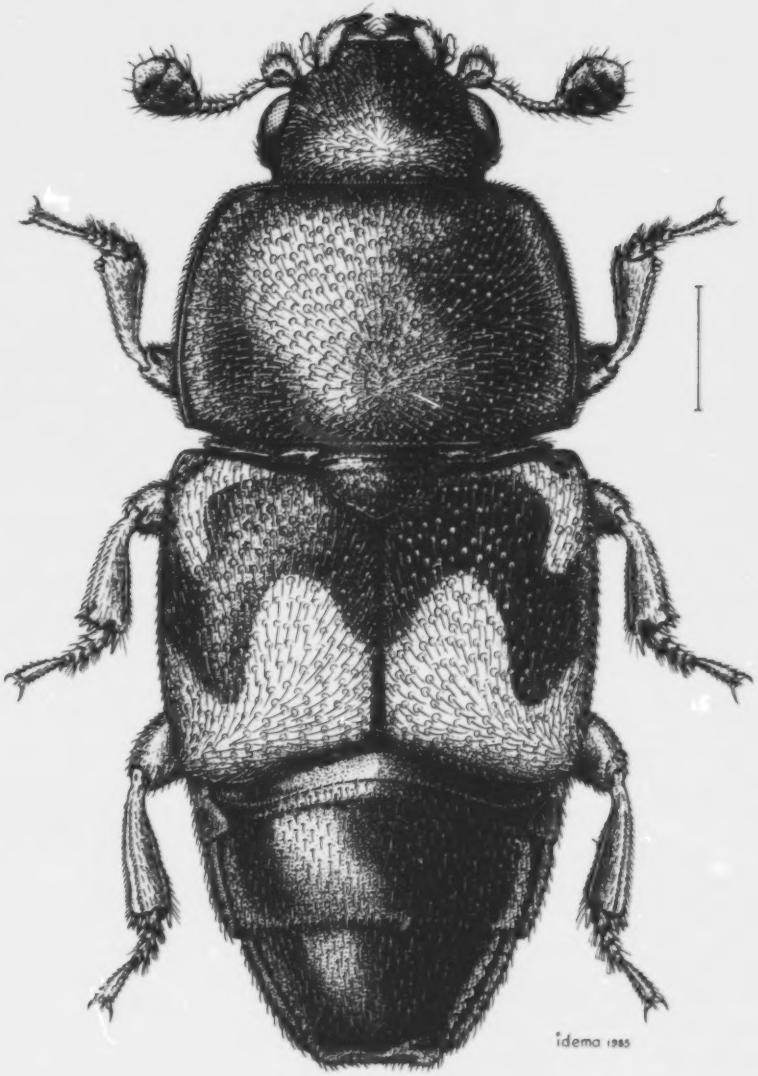

Fig. 216 ***Carpophilus hemipterus*** **(Linnaeus). Scale = 0.5 mm.**

Economic importance: In the field this species is commonly found in a wide variety of overripe fruit. The damage is done by both adults and larvae, which feed on the flesh of fruit, particularly when contaminated by fungi and yeasts. The species has also been found in all kinds of dried fruit and much less frequently in cereals, oilseeds, and their derivatives.

Glischrochilus fasciatus (Olivier)
redspotted sap beetle
nitidule fascié

Diagnosis: The two species of *Glischrochilus* included in this guide differ from the other nitidulids dealt with here by their larger size (length 4–7 mm), the absence of visible pubescence on the pronotum and the elytra, fused labrum and clypeus, and the presence of two sharply contrasting yellowish spots on each elytron. Adults of *G. fasciatus* differ from those of *G. quadrisignatus* mainly by the shape of the elytral spots; the anterior one is trilobed and the posterior one more or less transverse.

Sexual dimorphism: Males have the apical margin of the elytron rounded to slightly oblique; females have the apical margin of the elytron strongly oblique (Fig. 254).

Distribution: Exclusively North American. In Canada the species is found from Nova Scotia west to Manitoba and in British Columbia.

Economic importance: Less important as a pest than *G. quadrisignatus*, this species is usually found in the field on fruit and vegetables already injured by other insects or birds. Occasionally, it is also found in stored products. Aitken (1975) recorded it from Canadian cargo ships carrying wheat.

Glischrochilus quadrisignatus (Say)
fourspotted sap beetle
nitidule à quatre points

Diagnosis: The species differs from *G. fasciatus* in having the anterior spot of each elytron subquadrate and the posterior one more or less oval.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American. In Canada the species occurs from Nova Scotia west to Manitoba and in British Columbia.

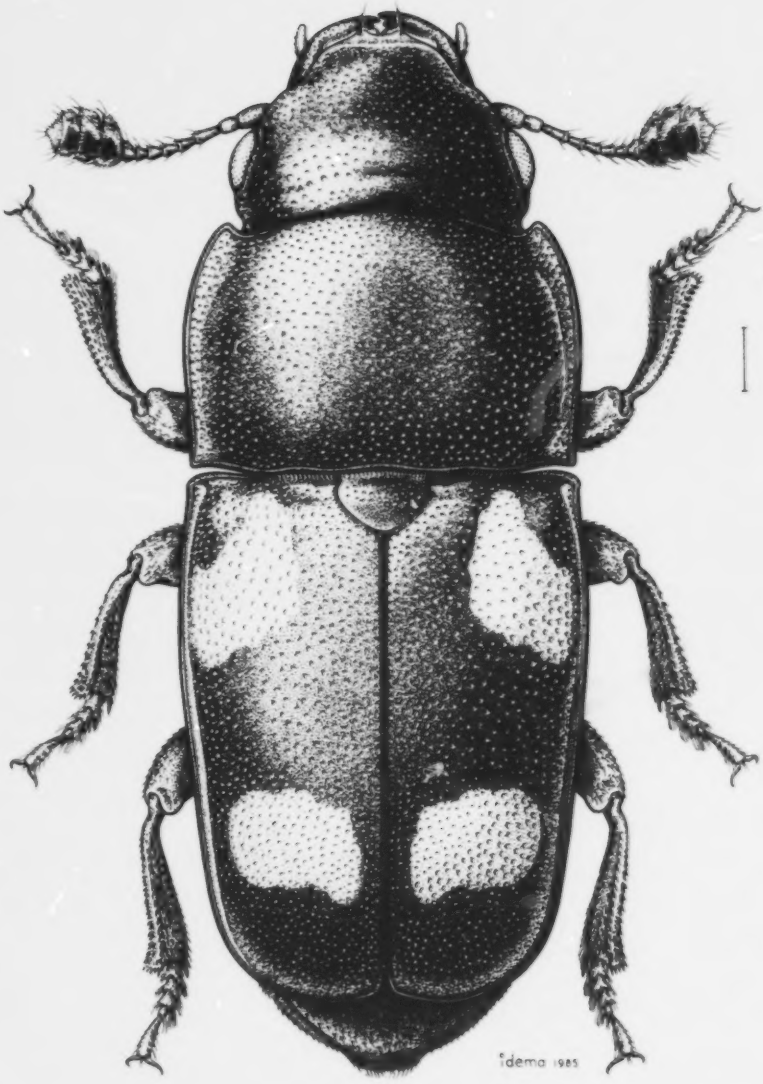

Fig. 217 ***Gischrochilus quadrisignatus*** **(Say). Scale = 0.5 mm.**

Economic importance: In Canada this species is a serious pest of fruit and vegetables in the field. The damage is done primarily by the adults, which bore into overripe fruit and kernels of corn initially injured by other insects. It has also been found, though much less frequently, in factories, warehouses, and houses associated with dried fruit and vegetables.

Nitidula bipunctata (Linnaeus)

Diagnosis: The species is readily distinguished from the other nitidulids dealt with here by the coloration of the elytra, which is dull brown to piceous, with a pair of pale spots at the middle, near the suture.

Sexual dimorphism: Sexes are externally similar.

Distribution: Widespread in the northern hemisphere. In Canada the species has been reported from Quebec west to British Columbia and in the Northwest Territories and the Yukon Territory.

Economic importance: Members of this species feed on carrion but have been found occasionally in dwellings, in food such as ham, sausage, bacon, bread, and cake.

Nitidula ziczac Say

Diagnosis: The species differs from the other nitidulids included here by the coloration of the elytra, which is dull light to dark brown, typically with three lighter longitudinal spots basally and one median sigmoid band. It also differs from *N. bipunctata* by being narrower, by the clearly wider pronotal and elytral fringes, and by the narrowly reflexed pronotal sides.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American (including Mexico). In Canada the species occurs in the temperate regions, from Manitoba west to British Columbia.

Economic importance: As for the preceding species, *N. ziczac* feeds mainly on carrion and has been reported only occasionally in dwellings.

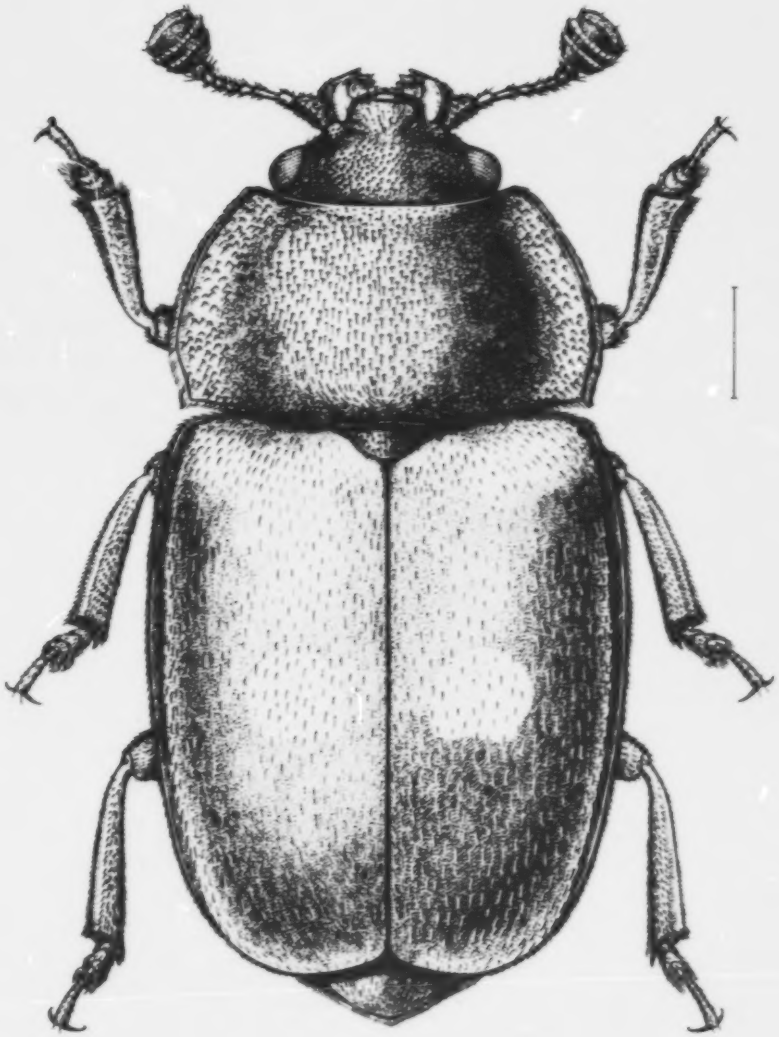

Fig. 218 ***Nitidula bipunctata*** **(Linnaeus). Scale = 0.5 mm.**

Omosita colon (Linnaeus)

Diagnosis: This nitidulid is readily separated from the other species of the family included here by the coloration of the elytra, which is dark with some pale spots on the anterior half and pale with a few dark spots on the posterior half.

Sexual dimorphism: Sexes are externally similar.

Distribution: Reported from Europe, northern Asia, and North America. The species occurs throughout eastern and central Canada as far as Manitoba and in British Columbia.

Economic importance: The species normally feeds on carrion and has been reported occasionally from dwellings and empty granaries.

Omosita discoidea (Fabricius)

Diagnosis: The species differs from the other nitidulids studied here by the coloration of the elytra, which is mainly pale with a few dark spots on the anterior two-thirds and mainly dark with some pale spots on the posterior third.

Sexual dimorphism: Sexes are externally similar.

Distribution: Known in Europe, northern Asia, and North America. In Canada the species ranges from Nova Scotia west to British Columbia.

Economic importance: As with the preceding species, *O. discoidea* is probably not a pest, as it feeds mainly on carrion. However, it has been found occasionally in dwellings and empty granaries.

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Dobson, R.M. 1954. The species of *Carpophilus* Stephens (Col. Nitidulidae) associated with stored products. Bull. Entomol. Res. 45:389–402.

Dobson, R.M. 1960. Notes on the taxonomy and occurrence of *Carpophilus* Stephens (Col. Nitidulidae) associated with stored products. Entomol. Mon. Mag. 95:156–158.

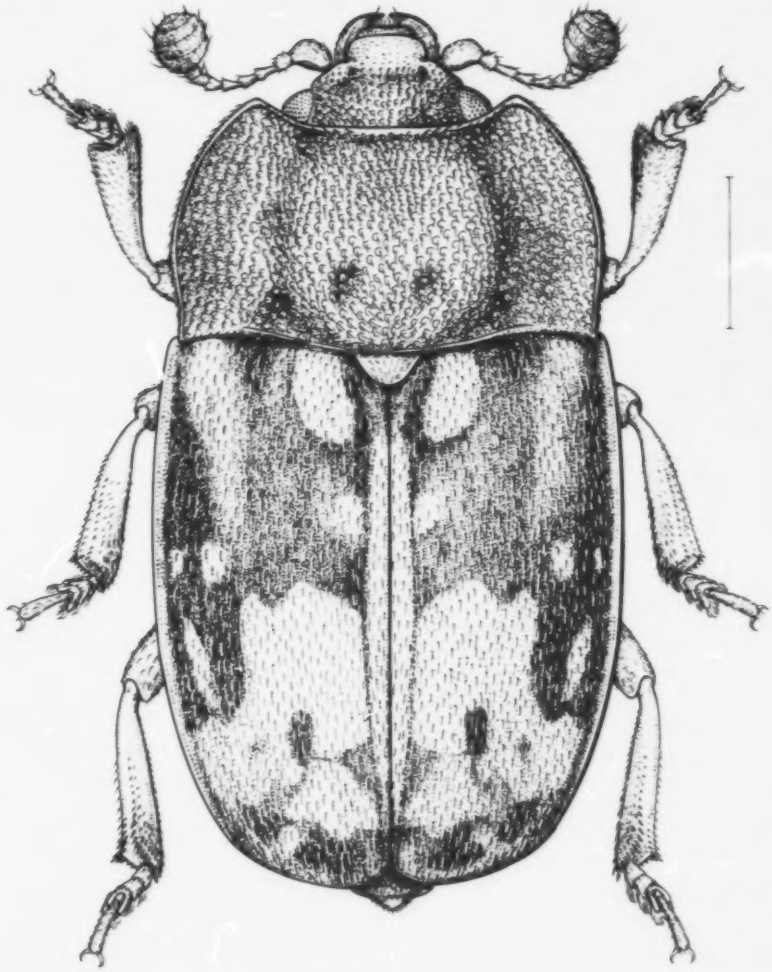

Fig. 219 *Omosita colon* (Linnaeus). Scale = 0.5 mm.

Foott, W.H.; Timmins, P.R. 1979. The rearing and biology of *Glischrochilus quadrisignatus* (Coleoptera: Nitudilidae) in the laboratory. Can. Entomol. 111:1337–1344.

Parsons, C.T. 1943. A revision of Nearctic Nitidulidae (Coleoptera). Bull. Mus. Comp. Zool. 92:121–278.

PTINIDAE spider beetles

About 15 species of this family are currently known in Canada. They are usually found in nests of mammals, birds, or bees, on dry carrion, or more commonly, indoors. Adults and larvae are scavengers that feed on a wide variety of dried animal and vegetable materials. Members of the family are commonly called spider beetles because of the superficial similarity of the adults of some species to small spiders.

Most ptinids occurring in Canada are minor pests in empty granaries, mills, warehouses, and dwellings, where they feed mainly on grain, flour, dried fruit, spices, and decaying animal and vegetable refuse. Their presence is often indicative of poor sanitation, with accumulations of residues. A few species have been reported to bore into wood to form pupal chambers. A few others are known to attack collections of dried insects and plants.

Gibbium aequinoctiale Boieldieu (synonym: *G. psylloides* auct.)

Diagnosis: The species is distinctive among the ptinids dealt with here in having the pronotum and elytra devoid of vestiture and punctation.

This species has been reported in many parts of the world, including North America, as *G. psylloides* (Czenpinski). Recently, Bellés and Halstead (1985), following Hisamatsu (1970), pointed out that the common stored-product species of *Gibbium* is *G. aequinoctiale* and that *G. psylloides* is a Palaearctic species most frequently found in the Mediterranean region. Adults of the two species differ mainly in the shape of the antennal fossa and the dorsal carina on the median lobe of the male genitalia (Bellés and Halstead 1985).

Sexual dimorphism: Males have a tuft of dense setae on the middle of the metasternum (Fig. 266). Such a tuft is absent in females.

Distribution: Cosmopolitan but more common in subtropical and tropical regions. In Canada the species has been found in Nova Scotia, New Brunswick, southern Quebec, and southern Ontario.

Economic importance: In Canada the species is found in flour mills and occasionally in warehouses and hospitals.

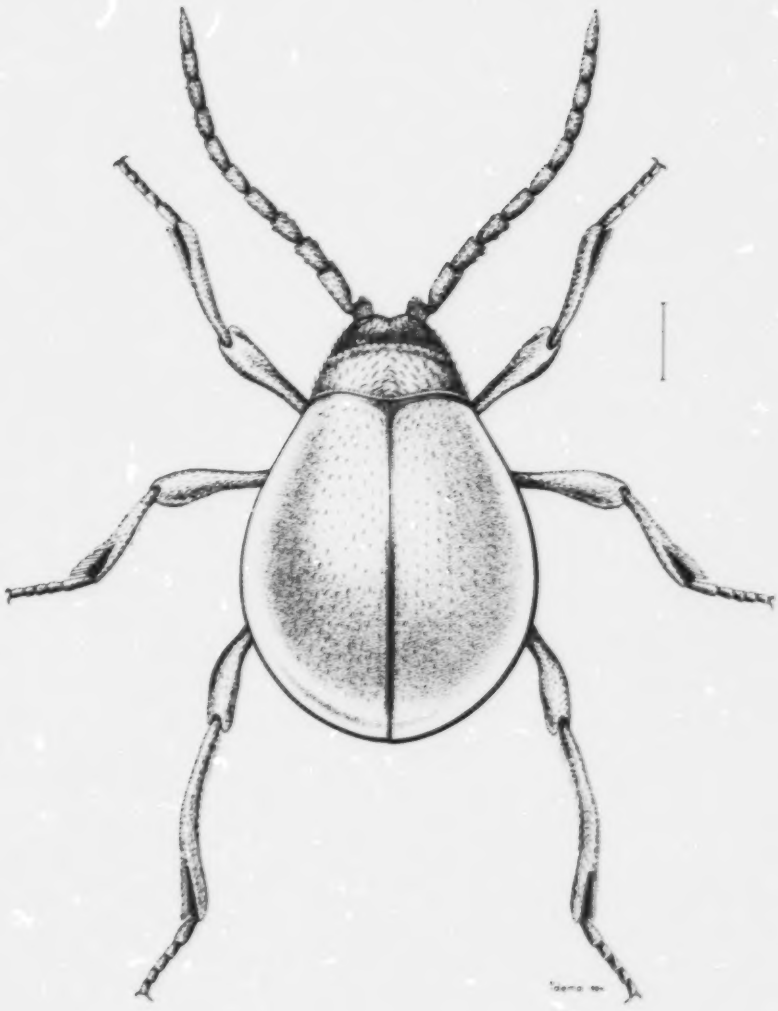

Fig. 220 *Gibbium aequinoctiale* Boieldieu. Scale = 0.5 mm.

Mezium affine Boieldieu
shiny spider beetle
ptine luisant

Diagnosis: The species is readily distinguishable from the other ptinids discussed here in having the pronotum densely hairy and the elytra devoid of punctation and vestiture, except for a narrow basal collar of golden setae and sometimes a few erect setae near the apex.

In the past, *Mezium affine* has been misidentified by some authors as *M. americanum* Laporte de Castelnau, the American spider beetle. Adults of *M. affine* differ from those of *M. americanum* in having the setal collar at the base of the elytra continuous, whereas in the latter species, the collar is deeply interrupted at, and on each side of, the middle. The American spider beetle does not occur in Canada but is occasionally intercepted at ports of entry.

Sexual dimorphism: Sexes are externally similar.

Distribution: Europe, North Africa, and introduced in North America and New Zealand. In Canada the species has been reported from Nova Scotia west to Saskatchewan and in British Columbia.

Economic importance: In Canada the species has been collected occasionally in warehouses and dwellings.

Niptus hololeucus (Faldermann)
golden spider beetle
niptus doré

Diagnosis: The species readily differs from the other ptinids studied here in having the pronotum and elytra entirely obscured by recumbent golden yellow setae with scattered erect golden ones.

Sexual dimorphism: Sexes are externally similar.

Distribution: Throughout the temperate regions. In Canada the species has been found in all provinces except Newfoundland.

Economic importance: In Canada the species has been found mainly in warehouses, sometimes in large numbers. It was recorded by Aitken (1975) on Canadian cargo ships carrying flour.

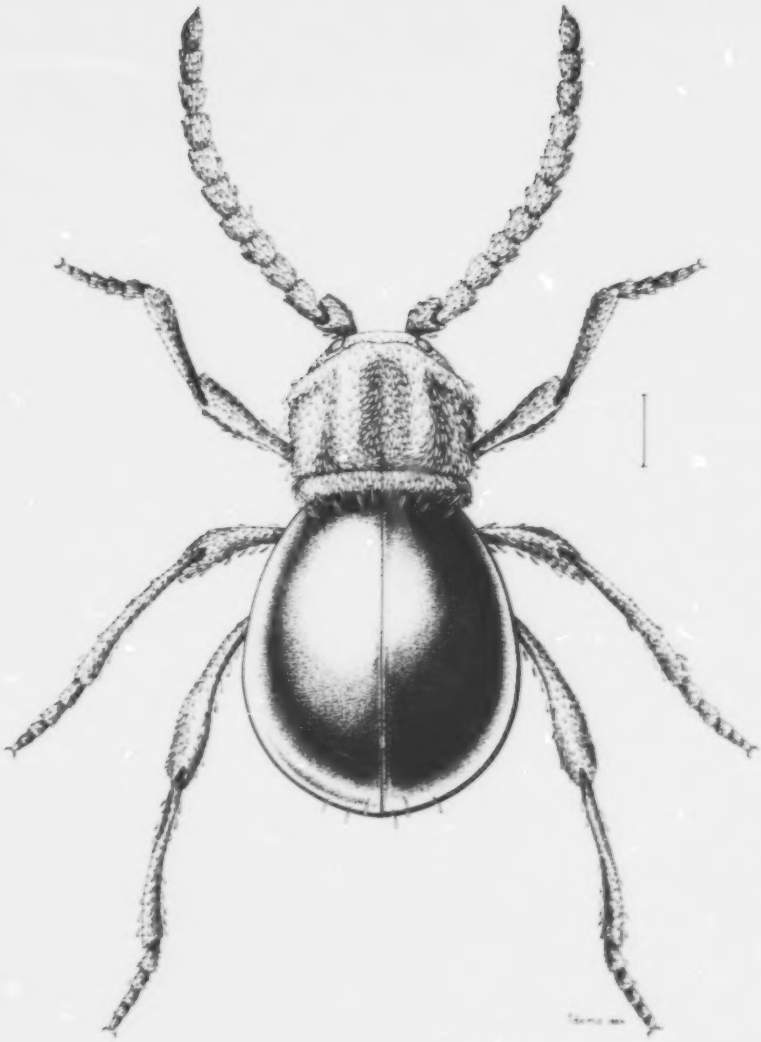

Fig. 221 *Mezium affine* Boieldieu. Scale = 0.5 mm.

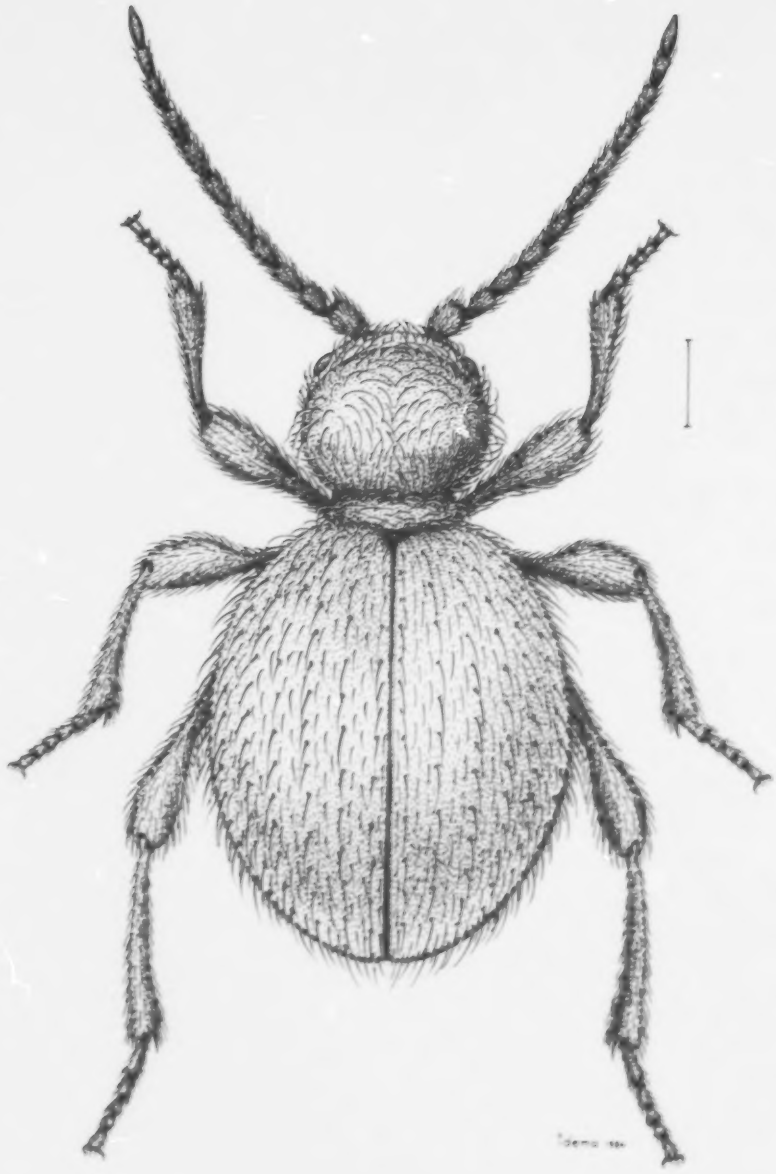

Fig. 222 *Niptus hololeucus* (Faldermann). Scale = 0.5 mm.

Pseudeurostus hilleri (Reitter)

Diagnosis: This ptinid differs from the other spider beetles included here mainly in having the hind trochanter extended to the elytral margin and the elytral vestiture sparse, consisting of a single row of suberect golden setae on each interval and stria.

Sexual dimorphism: Males have the last exposed abdominal sternum devoid of tufts of setae; females have 2 subapical tufts of setae on the last exposed sternum (Fig. 267).

Distribution: Japan and introduced in North America since 1921 and in Great Britain since about 1940. In Canada the species has been reported in New Brunswick, Quebec, Ontario, Alberta, and British Columbia.

Economic importance: As far as is known, all specimens collected in Canada have been found in warehouses. Pellitteri and Boush (1983) reported the species in feed mills in southern Wisconsin.

Ptinus bicinctus Sturm

Diagnosis: The species is superficially similar to *P. fur* but differs in having the setae on the disc of the pronotum more or less evenly distributed, not forming distinct tufts.

Sexual dimorphism: Males (as in Fig. 224) have the elytra subparallel-sided, the eyes larger and more convex, the antennae longer (10th segment about five times as long as wide), and the metasternum longer, feebly convex, and with a median longitudinal line. Females (as in Fig. 225) have the elytra subobovate, the eyes smaller and less convex, the antennae shorter (10th segment about twice as long as wide), and the metasternum shorter, more convex, and without a median line.

Distribution: Europe, North Africa, and introduced in North America. In Canada *P. bicinctus* has been found in Nova Scotia, New Brunswick, Quebec, Ontario, Alberta, and British Columbia.

Economic importance: In this country the species is occasionally reported in warehouses and dwellings.

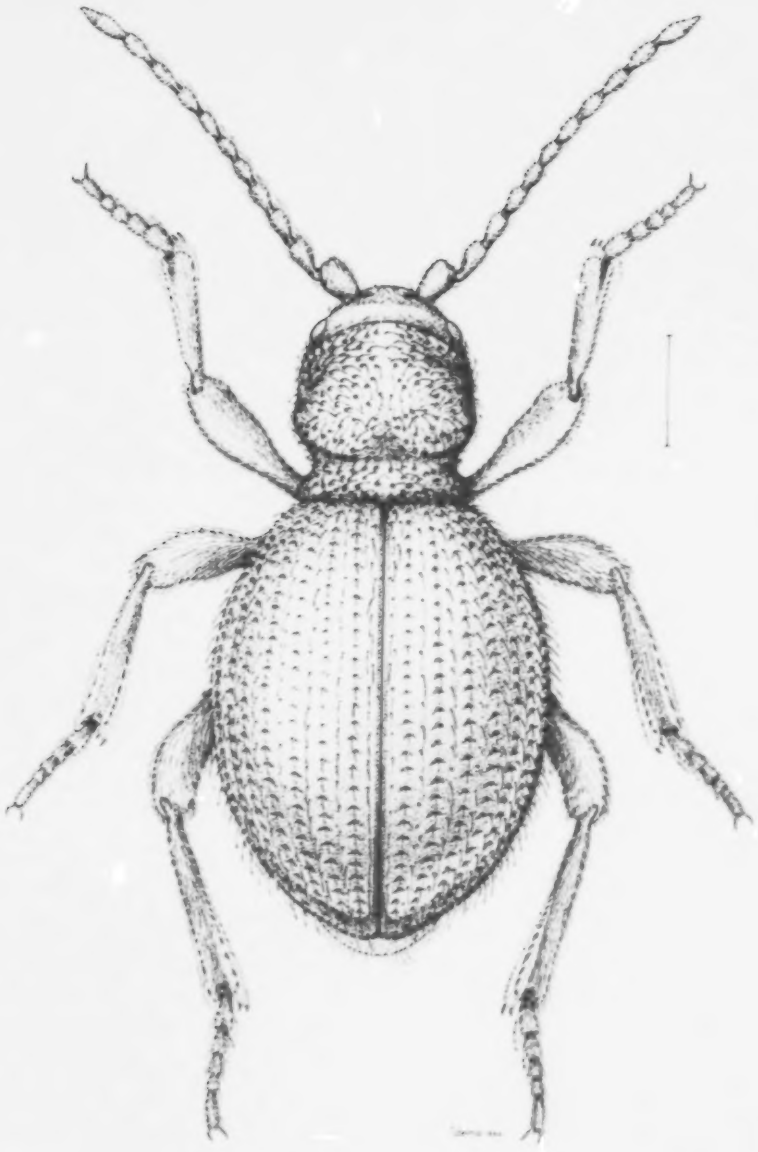

Fig. 223 *Pseudeurostus* hilleri (Reitter). Scale = 0.5 mm.

Ptinus clavipes Panzer (synonym: *P. hirtellus* Sturm)
brown spider beetle
ptine brun

Diagnosis: The species is separated from the other *Ptinus* dealt with here, except *P. ocellus*, by its elytra devoid of white scales. It differs from *P. ocellus* in having the elytral surface not obscured by the vestiture.

Females of this species exist in two forms, a diploid sexual form and a triploid parthenogenetic form. Both were believed to represent separate species, under the name *P. hirtellus* Sturm and *P. latro* Boieldieu respectively, until Moore et al. (1956) demonstrated that there is only a single species. The diploid form differs from the triploid form in having the elytra less elongate, the setae on the pronotum and elytra less coarse, the setae on the elytral intervals slightly unequal in size, and the humeral region with a patch of appressed pale yellow setae.

Sexual dimorphism: Males (as in Fig. 224) have the elytra subparallel-sided, the eyes larger and more convex, and the antennae longer (10th segment about five times as long as wide). Females (as in Fig. 225) have the elytra subobovate, the eyes smaller and less convex, and the antennae shorter (10th segment about twice as long as wide).

Distribution: Almost cosmopolitan. In Canada adults of the diploid form have been found in Nova Scotia, Quebec, Ontario, and British Columbia; females of the triploid form have been collected in Montreal and Toronto.

Economic importance: The diploid form is found under natural conditions in the nests of wasps, birds, and rats, as well as in warehouses. The triploid form has been found mainly in warehouses, where it lives in close association with the bisexual form. The females of the parthenogenetic form must mate with males of the sexual form to reproduce or, less successfully, with males of *P. pusillus* and *P. fur*. The sperm activates the egg but does not contribute any chromosomes. This species has been recorded by Aitken (1975) on Canadian cargo ships carrying wheat.

Ptinus fur (Linnaeus)
whitemarked spider beetle
ptine bigarré

Diagnosis: The species is distinguished from the other *Ptinus* included here in having 2 tufts of setae on the pronotal disc, with the surface between the tufts dull, punctured, and granulated.

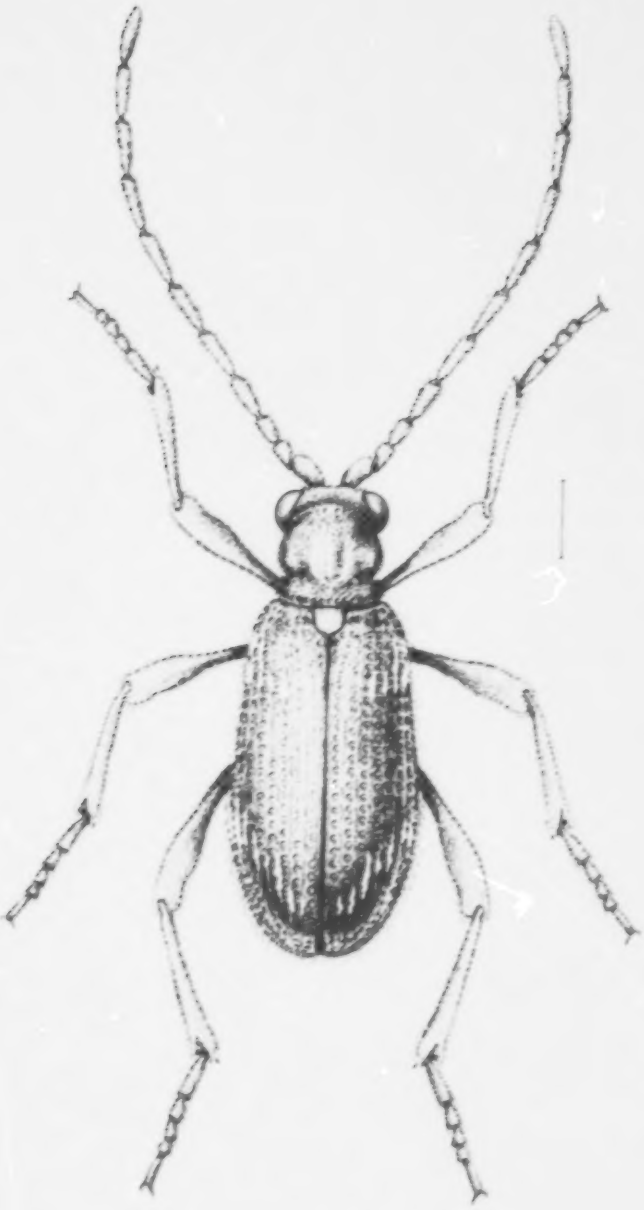

Fig. 224 *Ptinus fur* (Linnaeus); male. Scale = 0.5 mm.

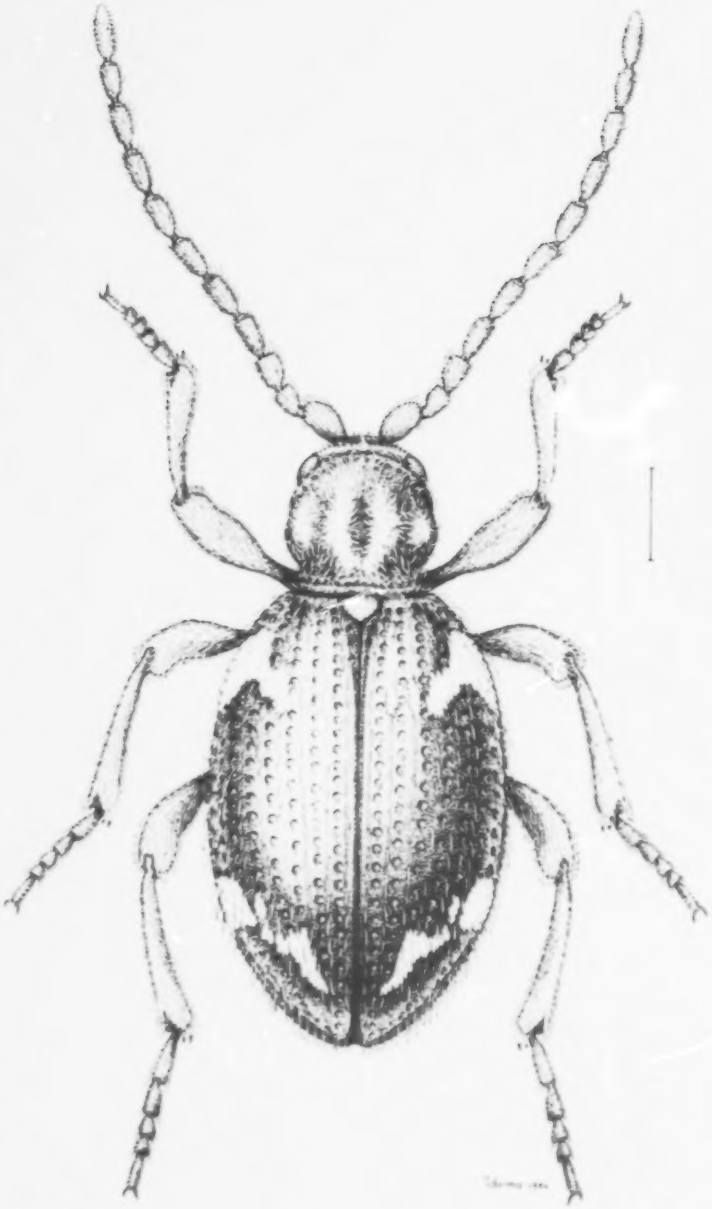

Fig. 225 ***Ptinus fur*** **(Linnaeus); female. Scale = 0.5 mm.**

Sexual dimorphism: Males (Fig. 224) have the elytra subparallel-sided, the eyes larger and more convex, the antennae longer (10th segment about five times as long as wide), the tufts of setae on the pronotal disc less defined, and the metasternum longer and convex. Females (Fig. 225) have the elytra subobovate, the eyes smaller and less convex, the antennae shorter (10th segment about twice as long as wide), the tufts of setae on the pronotal disc more defined, and the metasternum shorter and flat.

Distribution: Reported from Europe, North Africa, Asia, New Zealand, and North America, where it was introduced before 1870. In Canada the species has been collected in all provinces.

Economic importance: In Canada, this species is found mainly in warehouses and dwellings, less frequently in museums, granaries, and grain elevators. It is one of the most commonly reported ptinids in British Columbia.

Ptinus ocellus Brown (synonym: *P. tectus* auct.)
Australian spider beetle
ptine ocellé

Diagnosis: The species differs from the other *Ptinus* dealt with here in having the elytral surface completely obscured by the vestiture, which consists mainly of dark golden appressed setae. Superficially, this species is most similar to *Niptus hololeucus* and *Trigonogenius globulus*, which also have the elytral surface completely obscured by the vestiture; adults of *P. tectus* are distinct, however, in having the area between the antennal insertions narrow instead of wide.

This species is known outside North America by the name *Ptinus tectus* Boieldieu. However, under article 72C(e) of the new *International Code of Zoological Nomenclature*, the valid name for the Australian spider beetle is *Ptinus ocellus* Brown, since *P. tectus* Boieldieu was originally proposed as a replacement name for *Ptinus pilosus* White (= *Dorcatoma pilosa* White, an anobiid).

Sexual dimorphism: Sexes are externally similar, unlike the other species of *Ptinus* dealt with in this guide.

Distribution: Originally from Tasmania and, outside the Australian region, known to be established in Europe and North America. Records of cargo ships obtained by Aitken (1975) in England suggest that the species may also be established at high altitudes in the tropics. In Canada *P. ocellus* ranges from coast to coast.

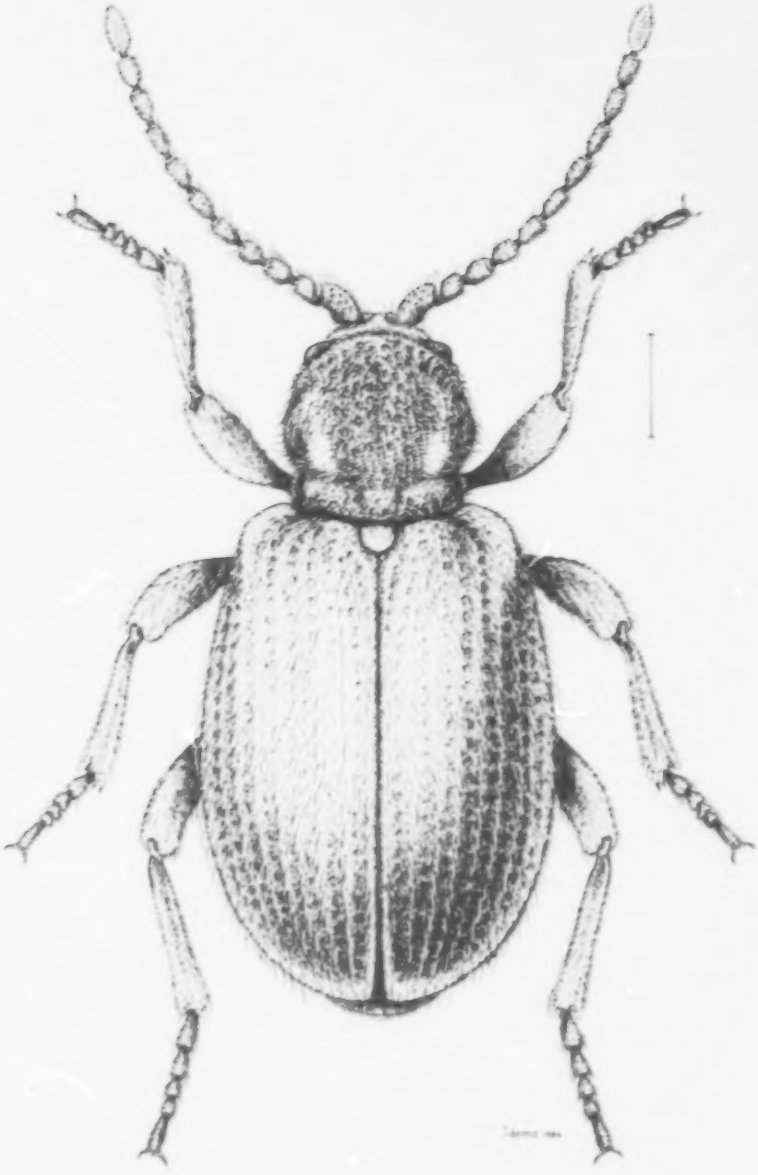

Fig. 226 *Ptinus ocellus* Brown. Scale = 0.5 mm.

Economic importance: This species is commonly found in warehouses in the eastern provinces and in British Columbia. In the Prairie Provinces, it seems less common and has been found mainly in grain elevators and flour mills.

Ptinus raptor Sturm
eastern spider beetle
ptine oriental

Diagnosis: The species is readily separated from the other *Ptinus* studied here in having 2 tufts of very dense setae on the pronotal disc, with the surface between the tufts shiny and smooth.

Sexual dimorphism: Males (as in Fig. 224) have the elytra subparallel-sided, the eyes slightly larger and more convex, the antennae longer (10th segment about five times as long as wide), and the metasternum longer and convex. Females (as in Fig. 225) have the elytra subobovate, the eyes slightly smaller and less convex, the antennae shorter (10th segment about twice as long as wide), and the metasternum shorter and flat.

Distribution: Europe and introduced in North America. In Canada the species ranges from coast to coast.

Economic importance: According to Gray (1941), *P. raptor* is the most common *Ptinus* in eastern Canada. It occurs mainly in cereal products in warehouses. The species was recorded in Canadian cargo ships carrying oats, wheat, and flour (Aitken 1975).

Ptinus villiger (Reitter)
hairy spider beetle
ptine velu

Diagnosis: Among the species of *Ptinus* discussed here, *P. villiger* is distinctive in having the setae on the elytral intervals clearly unequal in length; some setae on the third, fifth, and seventh intervals are about twice as long as those of the remaining intervals. In the other *Ptinus*, the setae on the intervals are subequal in size, or some setae on the third, fifth, and seventh intervals are slightly longer than but less than twice as long as those of the remaining intervals.

Sexual dimorphism: Males (as in Fig. 224) have the elytra subparallel-sided, the eyes slightly larger and more convex, the antennae longer (third segment twice as long as the second), and the metasternum longer and convex in the posterior half. Females (as in Fig. 225) have the elytra subobovate, the eyes slightly smaller and less convex, the antennae shorter (third segment slightly longer than the second), and the metasternum shorter and flat.

Distribution: Europe, Siberia, and introduced in North America, where it seems to be restricted to the cold temperate regions. In Canada the species ranges from coast to coast.

Economic importance: One of the most common ptinids in Canada and a serious pest of cereal products, particularly damp grain, and of animal feeds in the Prairie Provinces. The species is found mainly in mills, empty granaries, and warehouses where bagged flour is stored.

Sphaericus gibboides (Boieldieu)

Diagnosis: The species differs from the other ptinids included here by the vestiture on the dorsal surface. The pronotum and elytra are covered with grayish testaceous scales with scattered, short setae slightly more golden; the scales and setae on the elytra are narrower than those on the pronotum.

Sexual dimorphism: Sexes are externally similar.

Distribution: Mediterranean region and introduced in western North America and New Zealand (Archibald and Chalmers 1983). In Canada the species is known only in southwest British Columbia.

Economic importance: In Canada the species has only been reported infesting foodstuffs in the Vancouver area. It was listed as a herbarium pest in California (Fall 1905). Grace (1985) recently found that the larvae damage cabinetwork in California by tunneling before pupation.

Tipnus unicolor (Piller & Mitterpacher)

Diagnosis: The species is distinguished from the other spider beetles discussed here in having the area between the antennal insertions wide and the elytral surface not obscured by the vestiture. The strial punctures are deep, rounded, at least half as wide as the intervals on the disc, and the elytral vestiture consists of a single row of suberect golden setae on the striae and sparse, recumbent, or suberect setae on the intervals.

Sexual dimorphism: Sexes are externally similar.

Distribution: Europe and introduced in Canada, where it has been reported only in Nova Scotia and New Brunswick.

Economic importance: In North America this species is known only from three specimens collected in warehouses in the Maritime Provinces. It is not clear whether or not the species is established on this continent.

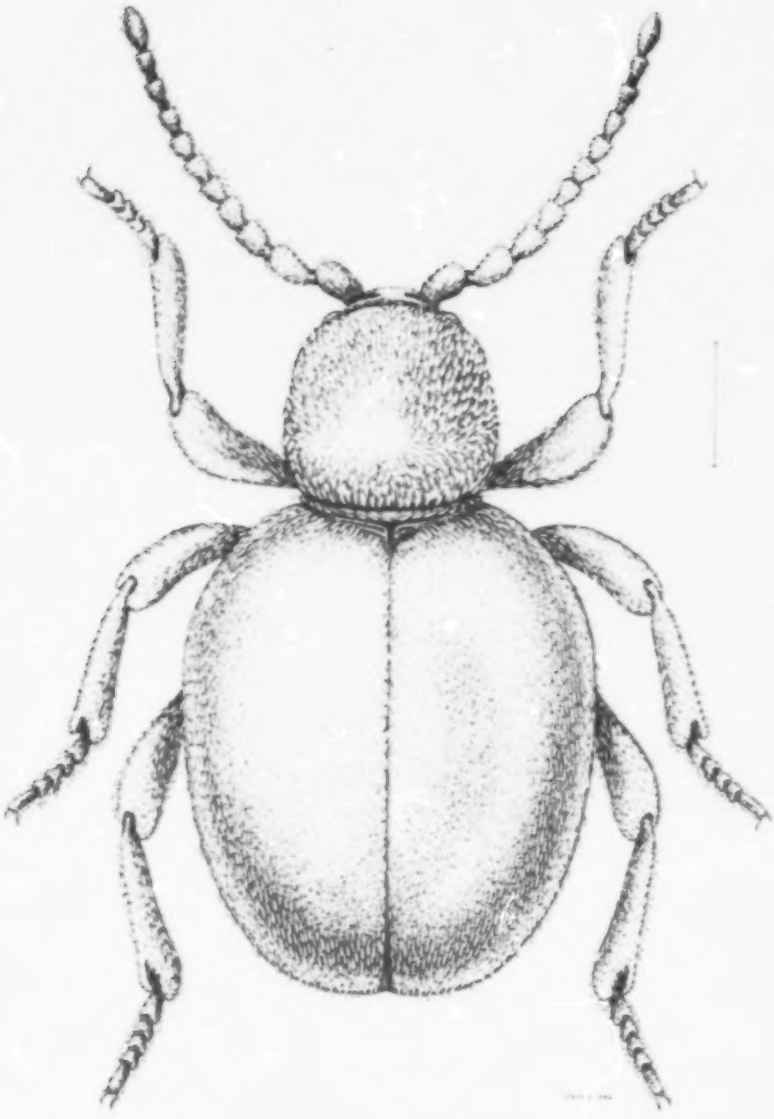

Fig. 227 *Sphaericus gibboides* (Boieldieu). Scale = 0.5 mm.

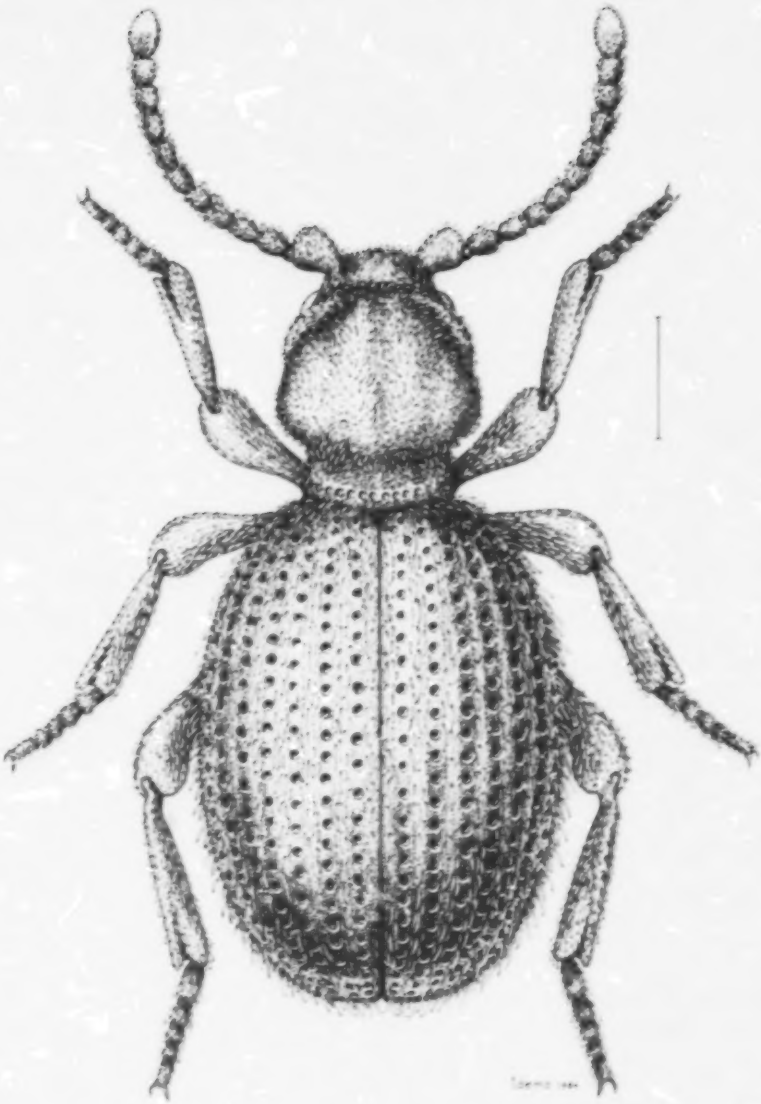

Fig. 228 *Tipnus unicolor* (Piller & Mitterpacher). Scale = 0.5 mm.

Trigonogenius globulus Solier
globular spider beetle
ptine globuleux

Diagnosis: The species is distinct from the other ptinids dealt with here by the elytral vestiture, which consists of very dense golden and patches of brown to black recumbent setae and erect golden or brown setae, unequal in length and arranged in longitudinal rows.

Sexual dimorphism: Males have a tuft of erect setae on the middle of the metasternum (Fig. 268). Females have no such tuft of setae.

Distribution: Reported in New Zealand, Australia, and some countries in Europe, Africa, North America, and South America. The species cannot colonize tropical regions (Howe 1959), except probably at high altitude (Aitken 1975). In Canada *T. globulus* is confined to British Columbia.

Economic importance: In Canada the species has been recorded, sometimes in large numbers, in warehouses, dwellings, and mill refuse.

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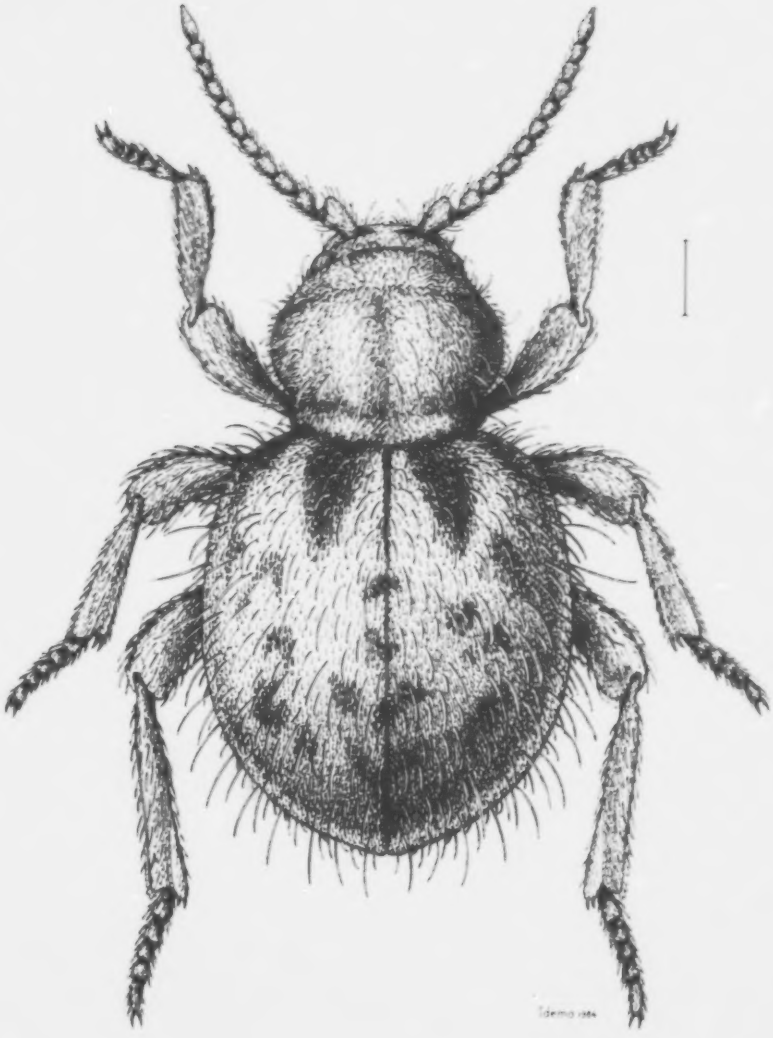

Fig. 229 *Trigonogenius globulus* Solier. Scale = 0.5 mm.

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RHIZOPHAGIDAE rhizophagid beetles

This family includes about 15 species in Canada. The adults are usually found in or under rotten logs, decaying vegetable and animal matter, and the bark of dead trees. Little is known about the bionomics of these species. Members of the subfamily Rhizophaginae are often associated with wood-boring insects on which they apparently prey; those of the subfamily Monotominae seem to be fungus feeders.

Two species of rhizophagids are found occasionally in stored foods in Canada. They do not cause damage to the products, because they probably feed on fungi.

Monotoma longicollis Gyllenhal

Diagnosis: The species differs readily from *M. picipes*, the other rhizophagid dealt with here, in having no foveae on the dorsum of the head and the pronotum widest on the anterior half, with the posterior angles rounded.

Sexual dimorphism: Males have two exposed abdominal terga, females only one (Fig. 255).

Distribution: Europe and introduced in North America. In Canada the species has been found in Newfoundland, New Brunswick, Quebec, Ontario, Saskatchewan, and British Columbia.

Economic importance: As stated for the family. The species is sometimes found in empty granaries.

Monotoma picipes Herbst

Diagnosis: This *Monotoma* is distinct from *M. longicollis* in having a pair of elongate foveae on the dorsum of the head and the pronotum widest near the middle or on the posterior half, with each posterior angle marked by a protuberance.

Sexual dimorphism: Males have 2 exposed abdominal terga (Fig. 255) and a median shallow depression on the first visible abdominal tergum. Females have 1 exposed abdominal tergum (Fig. 255) and no depression on the first abdominal tergum.

Distribution: Europe and introduced in North America. In Canada the species has been found in Newfoundland, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia.

Economic importance: As stated for the family. The species has been found regularly by Smith and Barker (1987) in granary residues in Saskatchewan. Aitken (1975) reported it in Canadian cargo ships carrying wheat.

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STAPHYLINIDAE rove beetles

The Staphylinidae is the largest family of beetles in Canada, comprising almost 2000 species (Campbell 1979). Adults and larvae are found in most terrestrial habitats, particularly on or under the following: the bark of dying or dead trees, rocks, debris, carrion, dung, fungi, flowers, foliage, and nests of ants and termites. Most staphylinids prey on small arthropods; some species eat fungi and decaying vegetation.

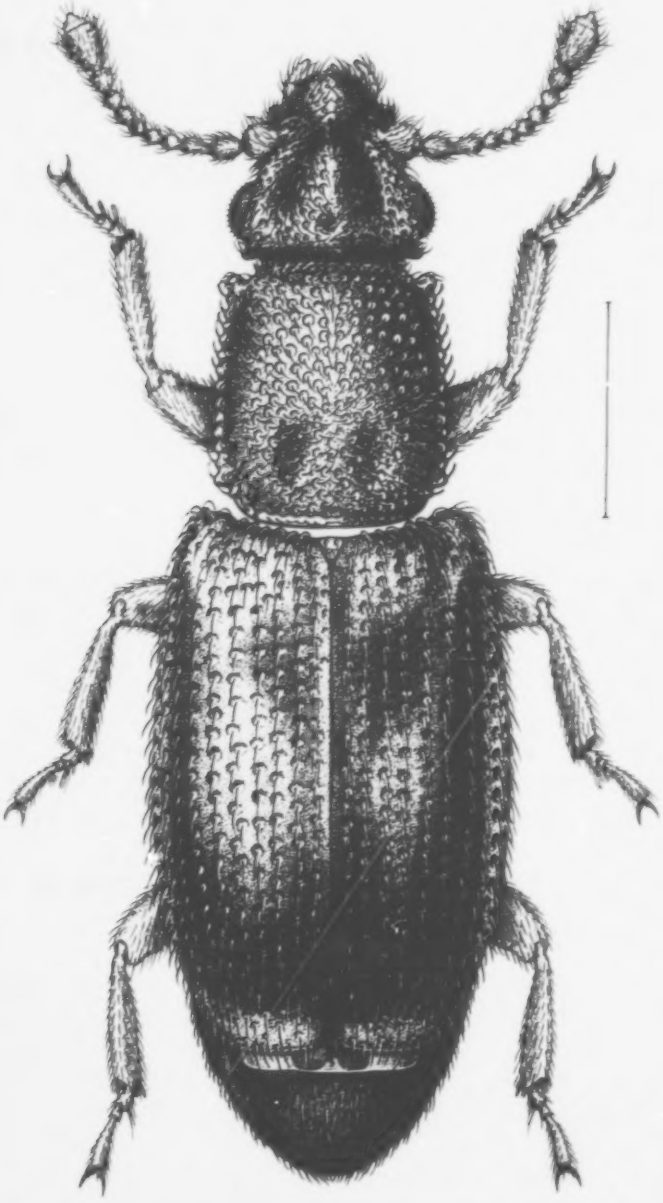

Fig. 230 *Monotoma picipes* Herbst. Scale = 0.5 mm.

In Canada rove beetles are incidental in stored products and dwellings. Their presence is usually an indication of moldy storage conditions or an important infestation by other arthropods.

TENEBRIONIDAE darkling beetles

This family is represented in Canada by about 110 species. In Canada tenebrionids occur mainly in or under logs, bark, rotten wood, and fungi; elsewhere, they are also found in nests of termites and ants, forming an important component of the desert community. Adults and larvae of many species feed on decaying vegetation, fungi, and humus; some species feed on the roots and stems of plants.

Comparatively few tenebrionids are economically important, but some are among the most serious pests of stored products.

Alphitobius diaperinus (Panzer)
lesser mealworm
petit ténébrion mât

Diagnosis: This species and its relative *Alphitobius laevigatus* are distinguished from the other tenebrionids dealt with here by their general habitus (Fig. 231), particularly their broad body and rounded elytra. Adults of *A. diaperinus* differ from those of *A. laevigatus* mainly in having the eye less deeply incised (width about 3 facets laterally), the pronotum flatter, the lateral margins less rounded and the posterior bead of the pronotum usually incomplete at the middle.

Sexual dimorphism: Males have the superior spur of the median tibia curved and the inferior one straight; females have both spurs of the median tibia straight (Fig. 257).

Distribution: Cosmopolitan and of tropical origin. In Canada the species ranges from Newfoundland west to British Columbia.

Economic importance: Adults and larvae feed on a wide variety of stored products but prefer grain, cereal products, and animal food that are damp and moldy. In North America as well as in Britain and Denmark the species is well known as a pest of poultry houses, breeding in deep litter and in droppings under the battery cages. Their larvae can transmit a variety of poultry diseases. In addition, they cause damage by burrowing into expanded polystyrene insulation panels in poultry production units (Gall 1980). The species seems to be of minor economic importance in Canada, but its presence indicates conditions favorable for the establishment of more serious pests. It is unlikely that the species could survive outdoors in Canada during the winter.

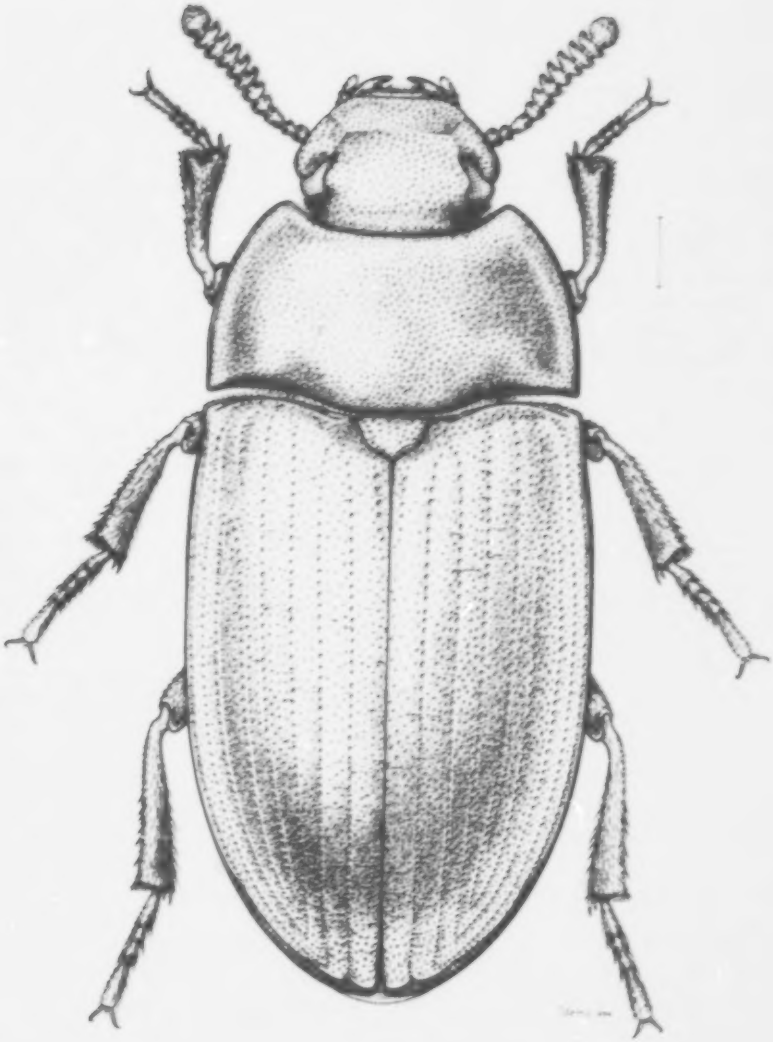

Fig. 231 *Alphitobius diaperinus* (Panzer). Scale = 0.5 mm.

Alphitobius laevigatus (Fabricius)
black fungus beetle
ténébrion des champignons

Diagnosis: The species differs from *A. diaperinus* in having the eye more deeply incised (width about 1 facet laterally) and the pronotum more convex, its lateral margins more rounded and the basal bead of the pronotum complete.

Sexual dimorphism: Males have the superior spur on the median tibia curved and the inferior one straight; in females both spurs on the median tibia are straight (Fig. 257).

Distribution: More or less cosmopolitan and of tropical origin. In Canada this species has been found only in southern Ontario.

Economic importance: In North America this species is a minor pest and less important than *A. diaperinus*; it has not been recorded in poultry houses. The adults and larvae feed on stored products that are damp and moldy. Despite the occurrence of *A. laevigatus* in southern Ontario, no records have been documented in stored products in Canada.

Alphitophagus bifasciatus (Say)
twobanded fungus beetle

Diagnosis: This small tenebrionid is distinctive among the species of the family dealt with here in having the elytral integument with well-delimited spots.

Sexual dimorphism: Males have the clypeus swollen and reflexed, the genae extended above the antennal insertions to form prominent, flattened, slightly recurved tubercles, and the frons with 2 longitudinal, parallel, carinate ridges extended from the middle to the epistomal suture; females do not have these modifications on the head (Fig. 258).

Distribution: More or less cosmopolitan. In Canada this species ranges from southern Quebec west to Saskatchewan.

Economic importance: In North America *A. bifasciatus* is a minor pest. Adults and larvae feed primarily on fungi and molds. They occur mainly in damp, moldy grain and spoiled cereal products found in granaries, grain elevators, mills, and warehouses. The species is also found in natural conditions under the bark of trees and in decaying vegetable matter (Triplehorn 1965).

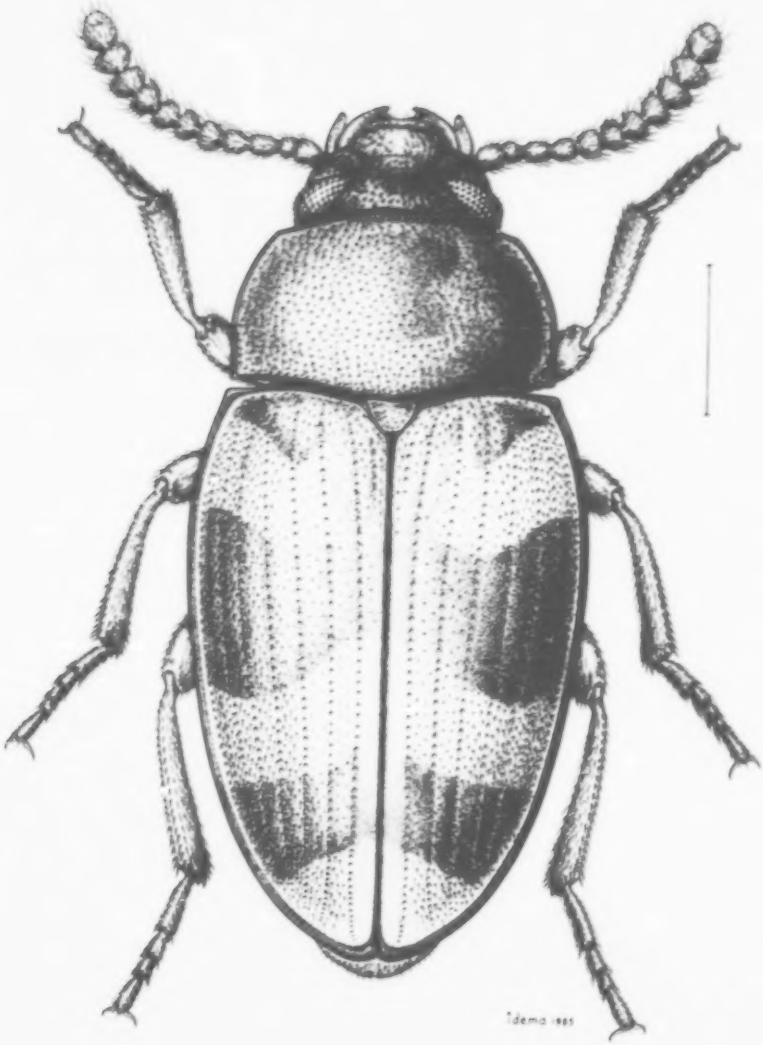

Fig. 232 ***Alphitophagus bifasciatus*** **(Say). Scale = 0.5 mm.**

Blapstinus substriatus Champion

Diagnosis: Among the tenebrionids discussed here this species is distinctive in having the eye completely divided into a dorsal and a ventral lobe.

Blapstinus metallicus Fabricius is another species found occasionally in stored products. In Canada the species occurs from Nova Scotia west to British Columbia. The adults differ from those of *B. substriatus* mainly by the shape of the pronotum: its anterior angles are prominent, and the lateral margins are straight to slightly sinuate in the posterior half. In *B. substriatus* the anterior angles are only slightly prominent, and the lateral margins are rounded.

Sexual dimorphism: Males have the first 3 segments of the fore tarsi dilated and densely pubescent ventrally; females have these segments of the fore tarsi neither dilated nor pubescent ventrally (Fig. 269).

Distribution: Exclusively North American. In Canada the species occurs from Quebec west to British Columbia; it is apparently more common in Saskatchewan, Alberta, and British Columbia.

Economic importance: This species is found occasionally in granaries and grain elevators. Its feeding habits are unknown.

Cynaeus angustus (LeConte)
larger black flour beetle

Diagnosis: The species differs from the other tenebrionids included here by the combination of size (length 5–6 mm), slightly incised eyes (width 3 or 4 facets laterally), and strong microsculpture on the disc of the pronotum.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American. According to Dunkel et al. (1982), the species originated in the southwestern United States or Mexico and spread progressively north and east in the 1920s and 1930s. It was first recorded in Canada in the 1940s and has since been found from southern Quebec west to Alberta.

Economic importance: So far, this species is not a serious pest in Canada but may eventually become more important. Barak et al. (1981) noted that in recent years, it has developed into a significant pest of stored shelled corn in Minnesota. Adults and larvae prefer stored products of plant rather than animal origin, with a preference

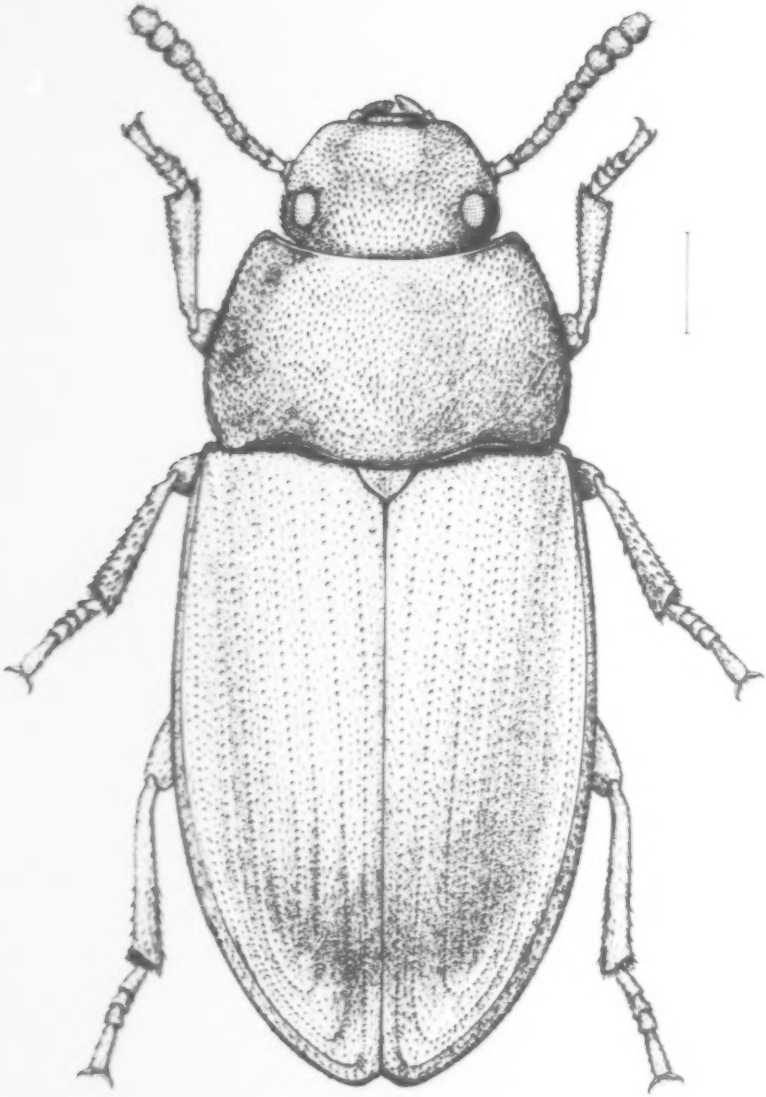

Fig. 233 *Blapstinus substriatus* Champion. Scale = 0.5 mm.

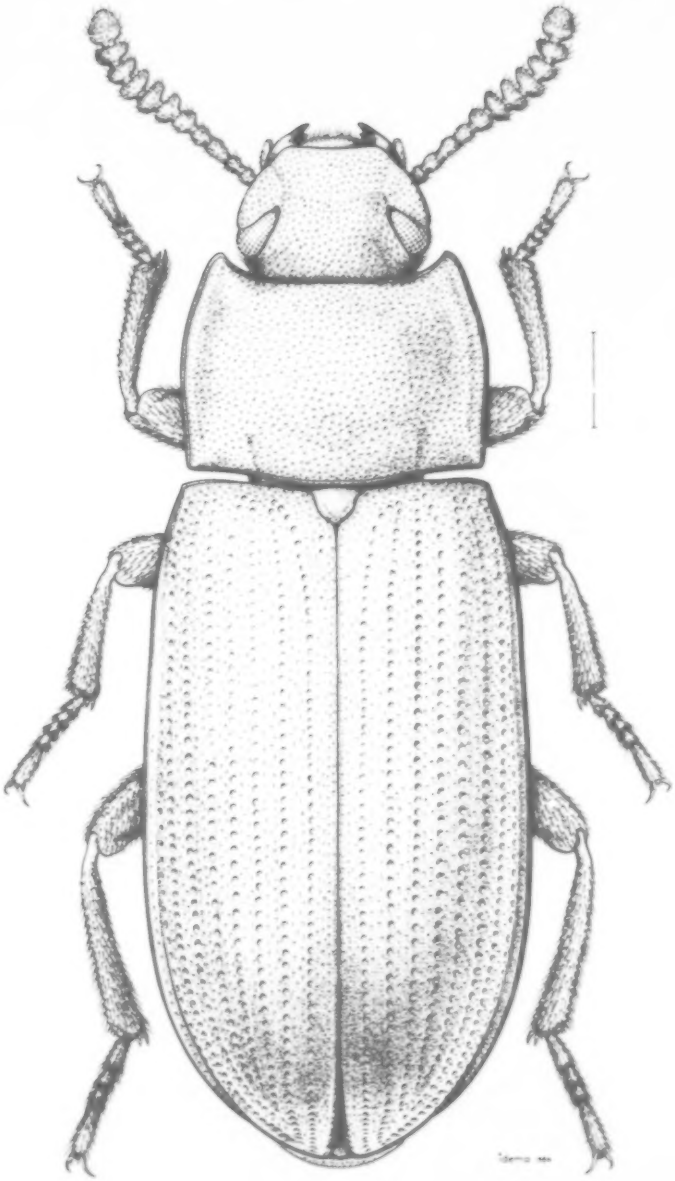

Fig. 234 *Cynaeus angustus* (LeConte). Scale = 0.5 mm.

for corn over other grains; unlike many tenebrionid pests, they attack sound grain. In Canada the species has been found in small numbers in granaries and sometimes in large numbers inside poultry houses. Under natural conditions, *C. angustus* occurs in the decaying interior of the agave flower stalk (Dunkel et al. 1982).

Gnatocerus cornutus (Fabricius)
broadhorned flour beetle

Diagnosis: Males are distinctive among the tenebrionids dealt with here by the structure of the head: each mandible bears a conspicuous, flattened, dorsal projection, the anterior margin of the head is swollen and sharply sinuate, and the frons has two small, triangular protuberances. Females, which have no projection on the mandible or protuberances on the frons and have the anterior margin of the head rounded, are superficially similar to members of *Tribolium*. They differ from the species of *Tribolium* discussed here in having the lateral bead of the pronotum continuous over the anterior margin and the intercoxal process of the prothorax parallel-sided.

Sexual dimorphism: As stated in the diagnosis.

Distribution: Cosmopolitan. In Canada the species has been found from Nova Scotia west to Manitoba and in British Columbia.

Economic importance: This species is a minor pest of cereal and animal products. In Canada it has been reported mainly in flour mills and warehouses; the species can probably survive winter conditions only in heated buildings.

Palorus ratzeburgii (Wissmann)
smalleyed flour beetle

Diagnosis: This species and its relative *P. subdepressus* are distinctive among the tenebrionids dealt with here in having the eye entire, not incised by the side margin of the head. Adults of *P. ratzeburgii* differ from those of *P. subdepressus* mainly in having the genae and the frons at the same level near the eyes and the anterior margin of the genae somewhat angulate laterally.

Sexual dimorphism: Males have large, deep, setigerous punctures on the median part of the second visible abdominal sternum (Faustini and Halstead 1982). Females have fine and diffuse punctures medially on the second abdominal sternum.

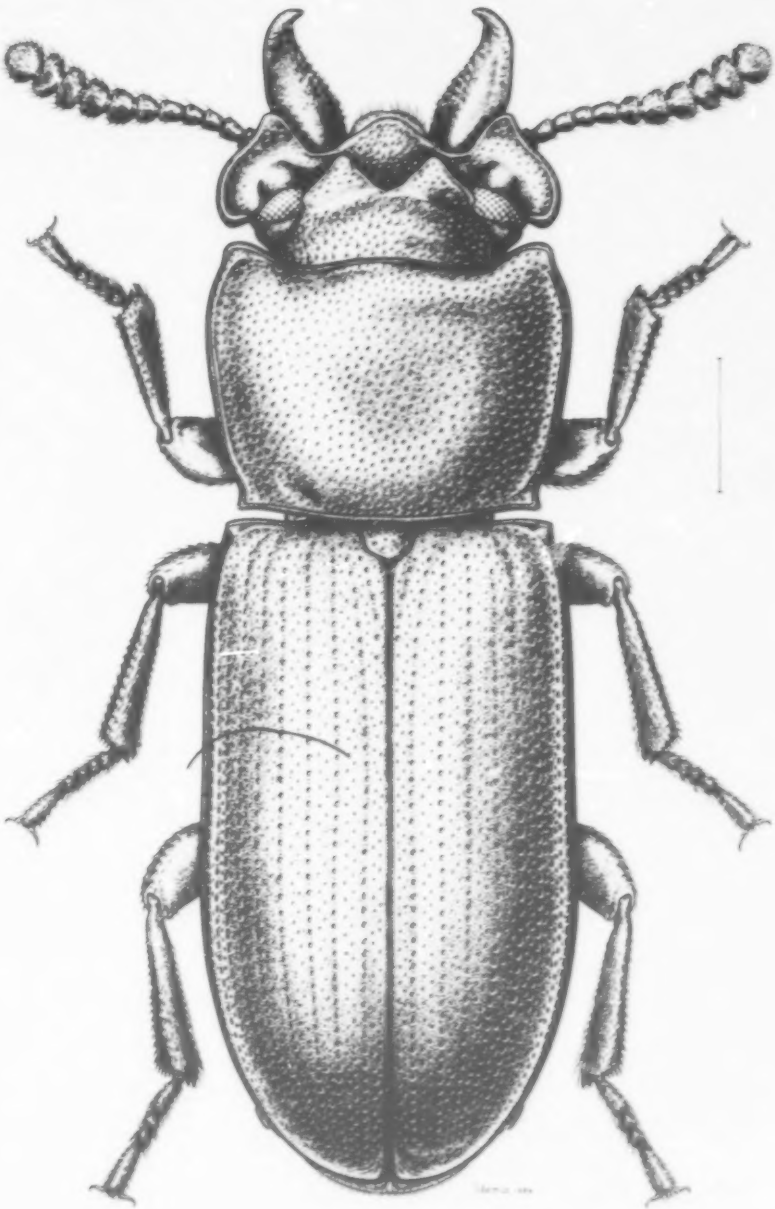

Fig. 235 *Gnathocerus cornutus* (Fabricius); male. Scale = 0.5 mm.

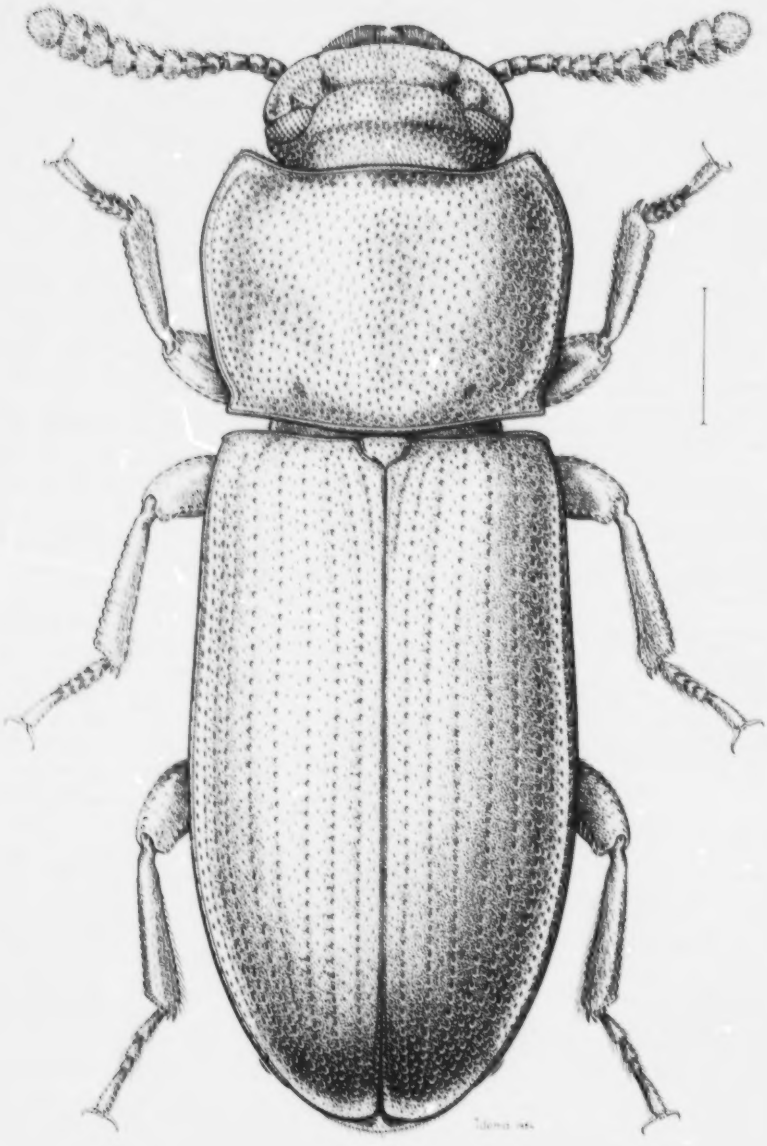

Fig. 236 *Gnathocerus cornutus* (Fabricius); female. Scale = 0.5 mm.

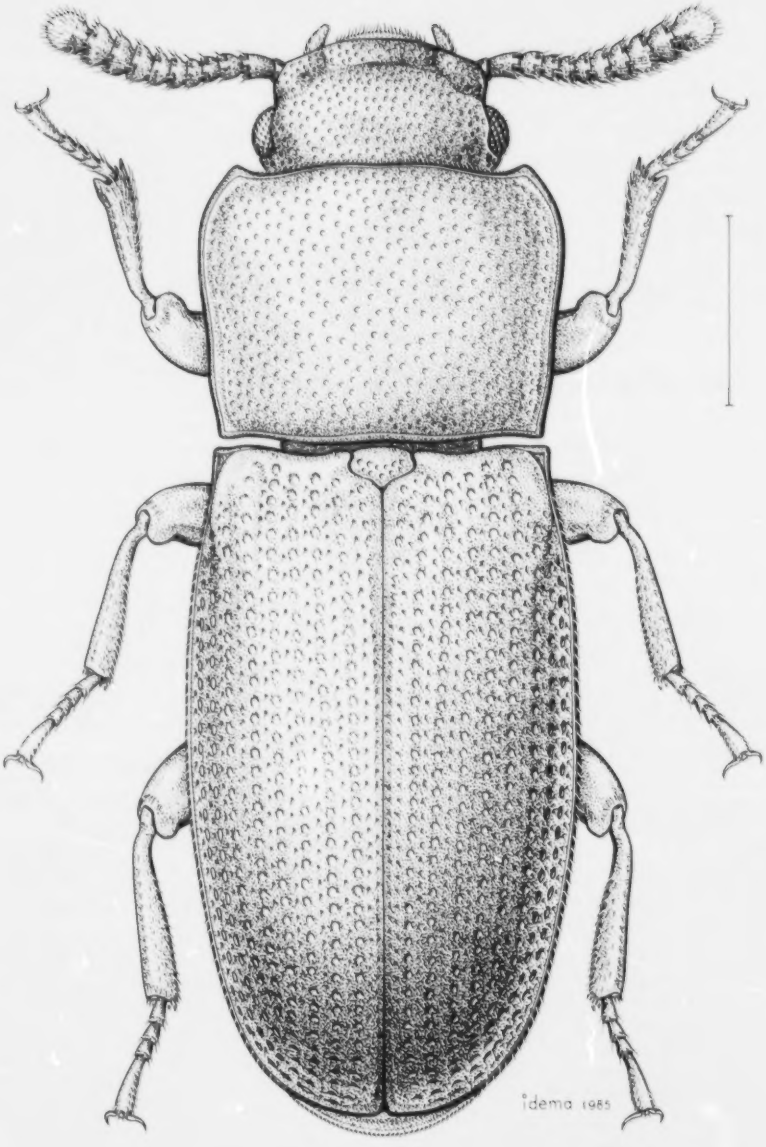

Fig. 237 ***Palorus ratzeburgii*** **(Wissmann). Scale = 0.5 mm.**

Distribution: Cosmopolitan and probably of North African origin (Halstead 1967). In Canada the species has been found in Nova Scotia, Quebec, Ontario, and the Vancouver area.

Economic importance: Adults and larvae feed mainly on damaged and moldy grain, showing a preference for wheat and oat products. They are found primarily in granaries, flour mills, and warehouses. In Canada the species is only a minor pest but is found regularly with primary grain pests such as species of *Sitophilus*. It also occurs under the bark of trees, both in Europe and in North America, where it has recolonized its natural habitat.

Palorus subdepressus (Wollaston)
depressed flour beetle

Diagnosis: The species is best separated from *P. ratzeburgii* in having the genae clearly reflexed near the eyes and the anterior margin of the genae rounded laterally.

Sexual dimorphism: Males have large, deep, setigerous punctures medially on the second visible abdominal sternum (Faustini and Halstead 1982). Females have only fine and diffuse foveae in that area.

Distribution: More or less cosmopolitan and based on morphological evidence (Halstead 1967), probably originated in Africa. In Canada the species has been found only in southern Manitoba.

Economic importance: The species is a minor pest in Canada. It has been found occasionally in barns, granaries, and grain elevators in Manitoba since 1974 (Smith 1975). Like *P. ratzeburgii*, adults and larvae are found primarily on cereals and their products. In the United States and India, the species is also found under the bark of trees, where it has recolonized its natural habitat.

Tenebrio molitor Linnaeus
yellow mealworm
ténébrion meunier

Diagnosis: This species and its relative *T. obscurus* are readily separated from the other tenebrionids dealt with here by their large size, which exceeds 10 mm. Adults of *T. molitor* differ from those of *T. obscurus* mainly in having the punctation on the clypeus, frons, and pronotum sparser, the elytra more parallel-sided, and the body more or less shiny.

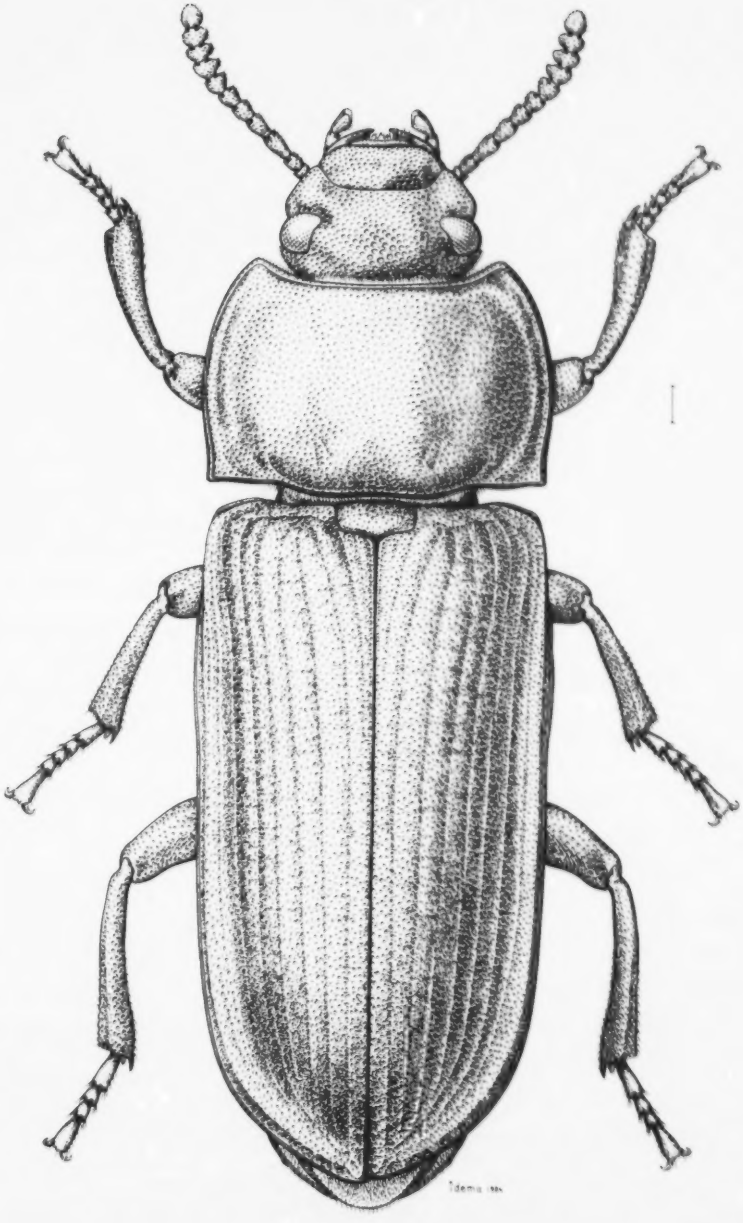

Fig. 238 *Tenebrio molitor* Linnaeus. Scale = 0.5 mm.

Sexual dimorphism: Males have the ventral angle at the apex of the fore tibia extended into a small process; females have the ventral angle of the fore tibia rounded (Fig. 259).

Distribution: Throughout most of the temperate regions and known to survive for a considerable time when introduced in the tropics, though incapable of breeding there. In Canada the species is found from Nova Scotia west to British Columbia.

Economic importance: Adults and larvae feed on a wide variety of materials of both animal and vegetable origin but have a preference for moist and decaying grain and cereal products. In Canada, they are found most frequently in granaries, grain elevators, mills, bakeries, and food stores. As is true for other stored-product pests, the damage done by this species is not due mainly to its feeding habits but largely to the presence of excrement and exuviae, which reduce the commercial value of the food. In Britain members of this species are common inhabitants of bird nests, especially those of pigeons.

Tenebrio obscurus Fabricius
dark mealworm
ténébrion obscur

Diagnosis: The species differs from *T. molitor* in having the punctation on the clypeus, frons, and pronotum denser, the elytra somewhat pear-shaped, and the body dull.

Sexual dimorphism: Males have the ventral angle of the fore tibia extended into a small process; females have the ventral angle rounded (Fig. 259).

Distribution: Throughout most of the temperate regions. In Canada the species probably occurs from coast to coast but has not yet been reported in Nova Scotia, New Brunswick, Manitoba, or Saskatchewan.

Economic importance: Like *T. molitor*, this species feeds on materials of both animal and vegetable origin. In Canada it is most commonly reported in the litter of chicken coops, birdhouses, and stables.

Tribolium audax Halstead
American black flour beetle

Diagnosis: The species is distinguished from the other *Tribolium* included here, except *T. madens*, in having the body dark brown to black with the eye about 4 facets wide laterally. Members of *T. audax* differ from those of *T. madens* generally by their smaller size and more elongate body shape, the denser punctation on the frons, the smaller

eyes, the less transverse and less convex pronotum, the presence of a slight depression on the prosternum in front of the intercoxal process, and the lack of a setiferous patch on the male fore femur. In addition, the width of the head across the eyes is subequal to that in front of the eyes.

Sexual dimorphism: Sexes are externally similar.

Distribution: Exclusively North American. In Canada the species ranges from Quebec west to British Columbia.

Economic importance: In Canada *T. audax* is usually found, sometimes in large numbers, in empty granaries, flour and feed mills, retail stores, warehouses, and boxcars; the adults and larvae feed on cereals and their products. The species is not as serious a pest as some of the other *Tribolium* species occurring in Canada. Under natural conditions, it dwells under the bark of *Pinus* and in cells of the bee *Megachile rotundata* (Fabricius).

Tribolium castaneum (Herbst)
red flour beetle
tribolium rouge de la farine

Diagnosis: The species is distinct from the other *Tribolium* dealt with here in having the ventral part of the eye large, extended medially to the level of the maxillary fossa. It is most similar in size and coloration to *T. confusum* but also differs from it by the 3-segmented antennal club and the less deeply incised eye (width 3 or 4 facets laterally).

Sexual dimorphism: Males have a setiferous patch on the posterior side of the fore femur (Fig. 260). Females have no such setiferous patch.

Distribution: Cosmopolitan but more common in warmer regions of the world. In Canada the species is found in the temperate regions, from Quebec west to British Columbia.

Economic importance: This species is an important pest of stored grain, oilseeds, and their derivatives. The adults and larvae feed on a wide variety of stored products. They attack sound grain, particularly when the moisture content is high, but prefer damaged grain. Although this beetle can probably survive winter conditions only in heated places, its occurrence in Canada has increased in the past 5 years, and serious infestations have been reported in granaries, flour mills, and feed mills throughout the Prairie Provinces. In Canada *T. castaneum* is the species found most frequently in imported produce on cargo ships (Monro 1969).

Tribolium confusum Jacquelin du Val
confused flour beetle
tribolium brun de la farine

Diagnosis: The species is separated from the other *Tribolium* studied here by its relatively small size (less than 4.5 mm) and the narrow eyes laterally (width of 1 or 2 facets). It is most similar to *T. castaneum* but differs from it in having the antenna with 5- or 6-segmented club and the eye only 1 or 2 facets wide laterally.

Sexual dimorphism: Males have a setiferous fovea on the posterior side of all femora. Females have no such setiferous fovea.

Distribution: Cosmopolitan. In Canada this species occurs from coast to coast.

Economic importance: This species is probably the most serious pest of the genus *Tribolium* and one of the most economically important beetles. It is notorious as a pest of cereal products, although the adults and larvae also feed on a wide variety of foodstuffs including sound grain. In Canada this beetle is found most frequently in flour mills and feed mills. It also occurs in warehouses, grocery stores, and dwellings. According to Sokoloff and Lerner (1967), when both *T. confusum* and *T. castaneum* occur in the same surroundings, they can coexist but only at a low population density. In mixed laboratory cultures, however, one of the two species is eliminated; the type of food and the temperature influence which of the two species survives.

Tribolium destructor Uyttenboogaart
large flour beetle
tribolium de la farine

Diagnosis: The species is best recognized among the *Tribolium* dealt with here by its relatively large size, which exceeds 4.5 mm, and the narrow eyes laterally (width of 1 or 2 facets).

Sexual dimorphism: Males have a setiferous area on the posterior side of the fore femur. Females have no such setiferous area.

Distribution: Known in Africa, where it probably originated, Asia, Europe, and North America. In Canada the species occurs from coast to coast.

Economic importance: This species is a pest of seeds, cereals, and their products. In Canada it usually occurs in flour and cereal products found mainly in flour mills, bakeries, and dwellings. Locally

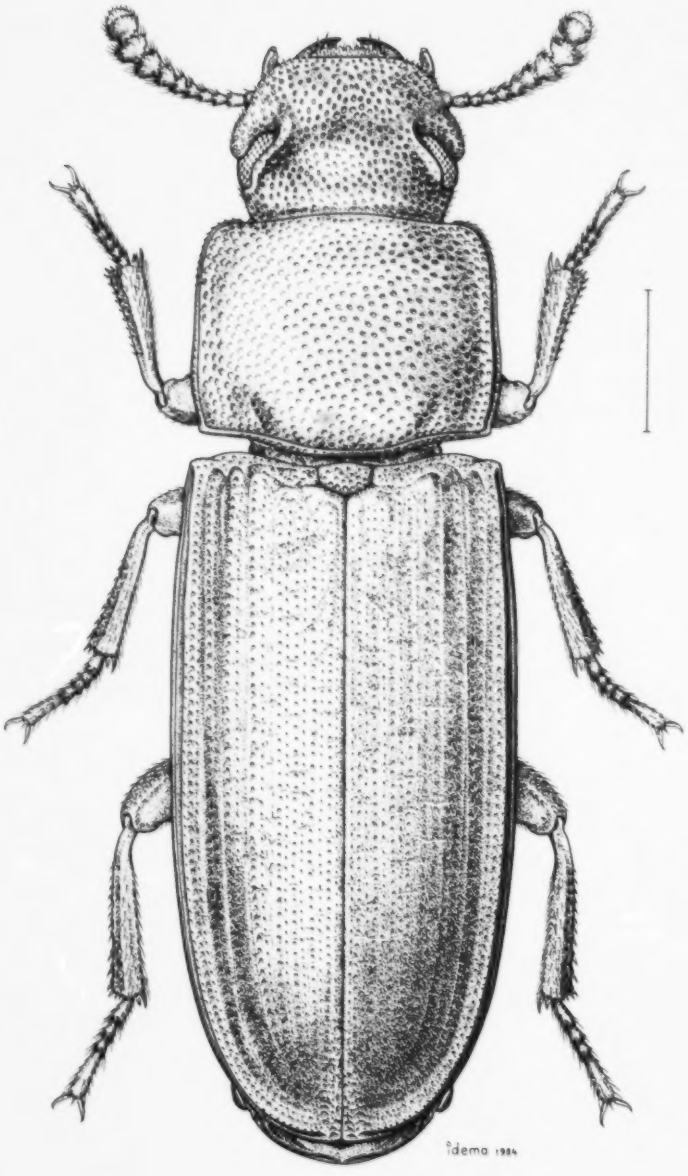

Fig. 239 *Tribolium confusum* Jacquelin du Val. Scale = 0.5 mm.

in Alberta, the species can be as economically important as other serious pests, such as *T. confusum* and *T. castaneum* (L.B. Smith, personal communication).

Tribolium madens (Charpentier)
black flour beetle

Diagnosis: This species is closely related to *T. audax*, and both were confused under the name *T. madens* until recently (Halstead 1969). This species differs from *T. audax* generally in being larger and less elongate and in having sparser punctation on the frons, larger eyes on the ventral side, usually a more transverse and more convex pronotum, the prosternum slightly convex in front of the intercoxal process, and a setiferous patch on the ventral side of the male fore femur. In addition, the width of the head across the eyes is a little less than in front of the eyes. The most reliable characteristics for the separation of the two species are listed in the key (H, couplet 13).

Sexual dimorphism: Males have a setiferous patch on the posterior side of the fore femur. Females have no such patch.

Distribution: Occurs throughout northern and eastern Europe and probably established in Egypt and Portugal (Halstead 1969). In North America the species was first recorded in 1977 from specimens collected in Kentucky. It was found for the first time in Canada in Winnipeg by Loschiavo in 1979 and has since been reported in Nova Scotia, New Brunswick, Quebec, and Ontario.

Economic importance: In Canada this species has been found, sometimes in large numbers, only in boxcars carrying flour. As noted by Becker (1982), the species is of little importance but could become a major pest of flour. In Europe *T. madens* has been reported as a secondary pest in flour mills and warehouses; in Czechoslovakia it also causes considerable damage to pollen stores in beehives (Halstead 1969).

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TROGOSITIDAE bark-gnawing beetles

This family includes about 20 species in Canada. The adults and larvae are found in or under logs, fungi, and the bark of dead trees. Many species prey on wood-eating insects or their eggs; other species feed on fungi or rotten plant materials.

Only one species of trogositids occurring in Canada is associated with stored products.

Tenebroides mauritanicus (Linnaeus)
cadelle

Diagnosis: The species is distinguished from the other beetles dealt with here by its general habitus (Fig. 240). Superficially, it resembles some species of tenebrionids but differs readily from them in having the eye not incised by the side margin of the head and the anterior angle of the pronotum hook-like.

Sexual dimorphism: Males have cribriform plates laterally on the anterior half of all visible abdominal sterna (see Faustini and Halstead 1982 for a SEM picture). Females have no such plates. Under the binocular microscope, the lateral part of the male abdominal sterna appears to have denser punctation, with punctures of various size. In females that area seems to have sparser and uniform punctation.

Distribution: Cosmopolitan. In Canada the species occurs in the temperate regions from coast to coast.

Economic importance: The species is a notorious primary pest of grain, cereal products, nuts, and dried fruit, among other foods. Both adults and larvae feed on products of either plant or animal origin and prey on other stored-product insects. In addition, the larvae cause damage by burrowing into woodwork of storage places to pupate. In Canada *T. mauritanicus* is found mainly in granaries, grain elevators, mills, and warehouses.

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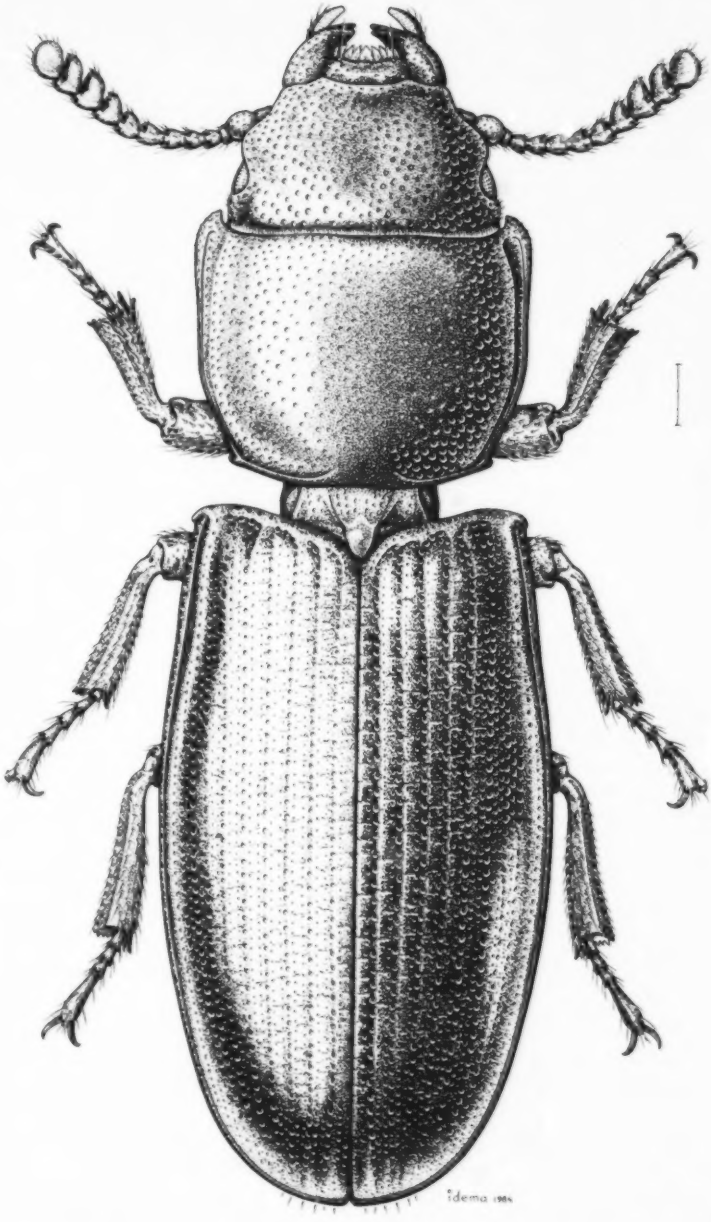
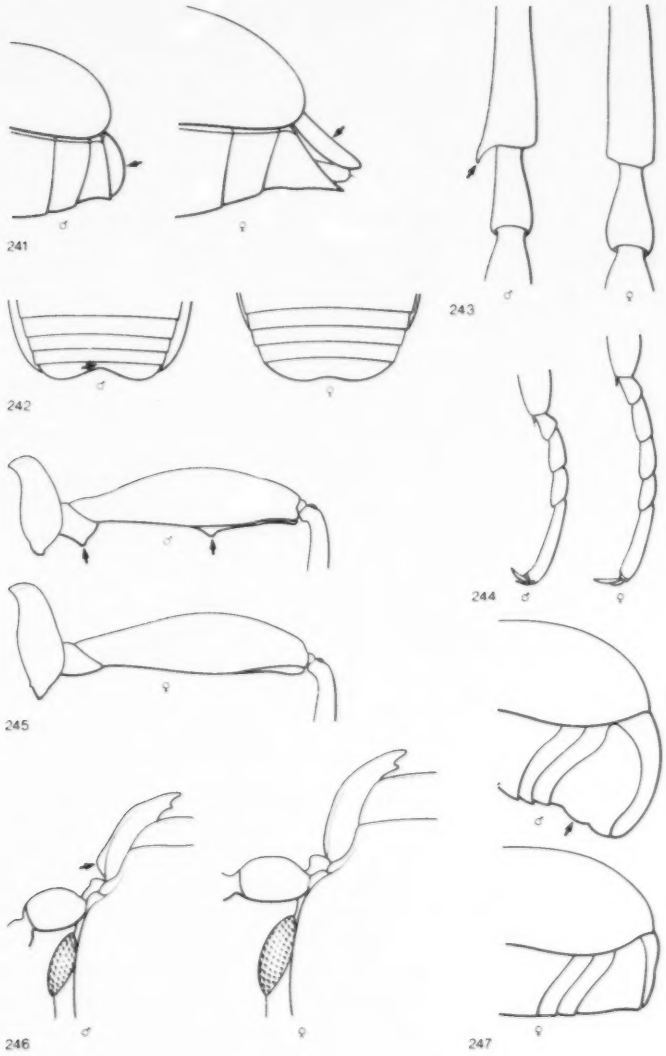
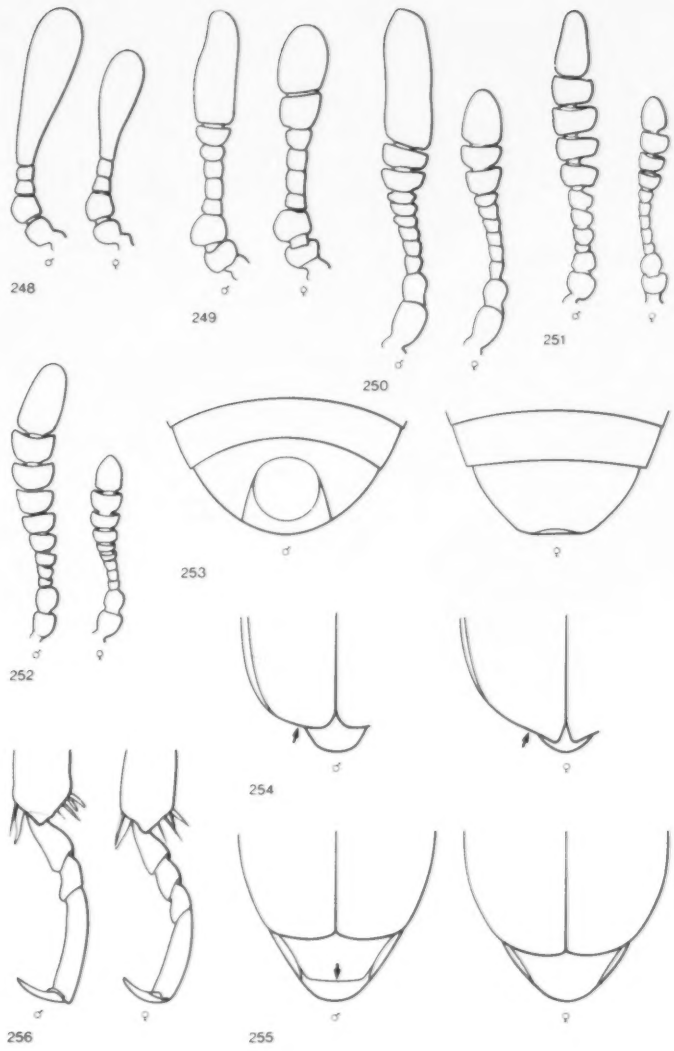


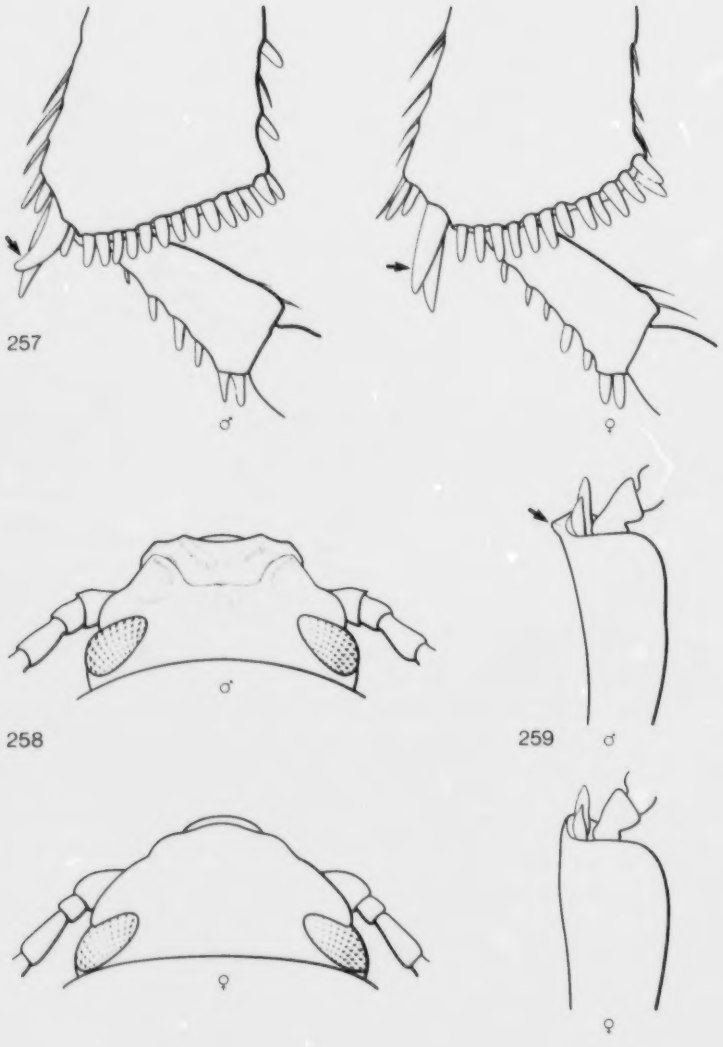
Fig. 240 *Tenebroides mauritanicus* (Linnaeus). Scale = 0.5 mm.



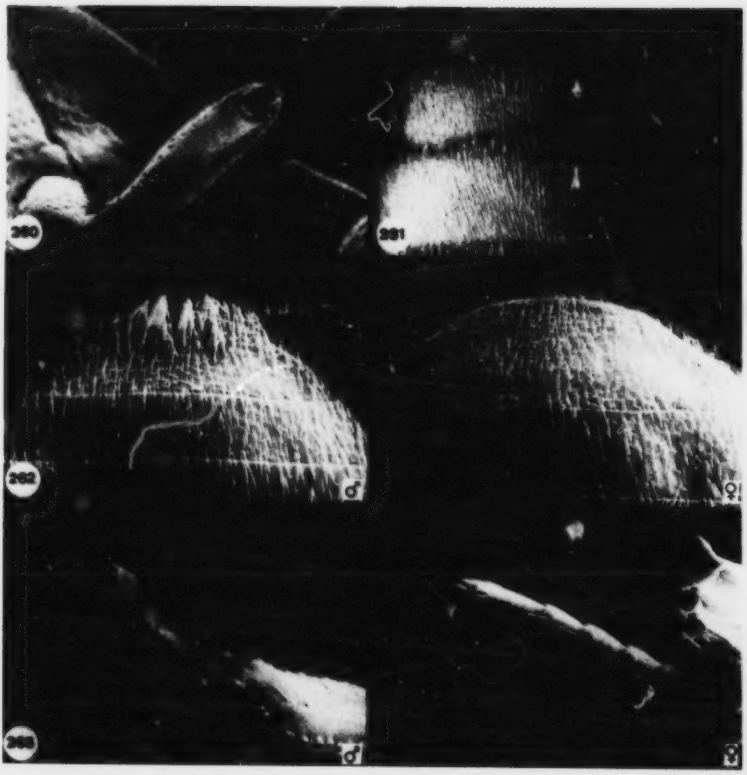
Figs. 241–247 (241) *Araecerus fasciculatus* (male, female), posterior extremity of abdomen (lateral view); (242) *Acanthoscelides obtectus* (male, female), posterior extremity of abdomen (ventral view); (243) *Bruchus pisorum* (male, female), apex of median tibia and first tarsal segment (ventral view); (244) *Cryptophagus varus* (male, female), hind tarsus; (245) *Oryzaephilus mercator* (male, female), basal part of hind leg (ventral view); (246) *Cryptolestes ferrugineus* (male, female), head (left half, dorsal view); (247) *Sitophilus granarius* (male, female), posterior extremity of abdomen (lateral view).



Figs. 248–256 (248) *Anthrenus fuscus* (male, female), antenna (dorsal view); (249) *Anthrenus museorum* (male, female), antenna (dorsal view); (250) *Attagenus unicolor* (male, female), antenna (dorsal view); (251) *Trogoderma sternale* (male, female), antenna (dorsal view); (252) *Trogoderma variabile* (male, female), antenna (dorsal view); (253) *Carpophilus brachypterus* (male, female), posterior extremity of abdomen (ventral view); (254) *Glischrochilus fasciatus* (male, female), apex of elytron (dorsal view); (255) *Monotoma picipes* (male, female), posterior extremity of body (dorsal view); (256) *Typhaea stercorea* (male, female), fore tarsus.

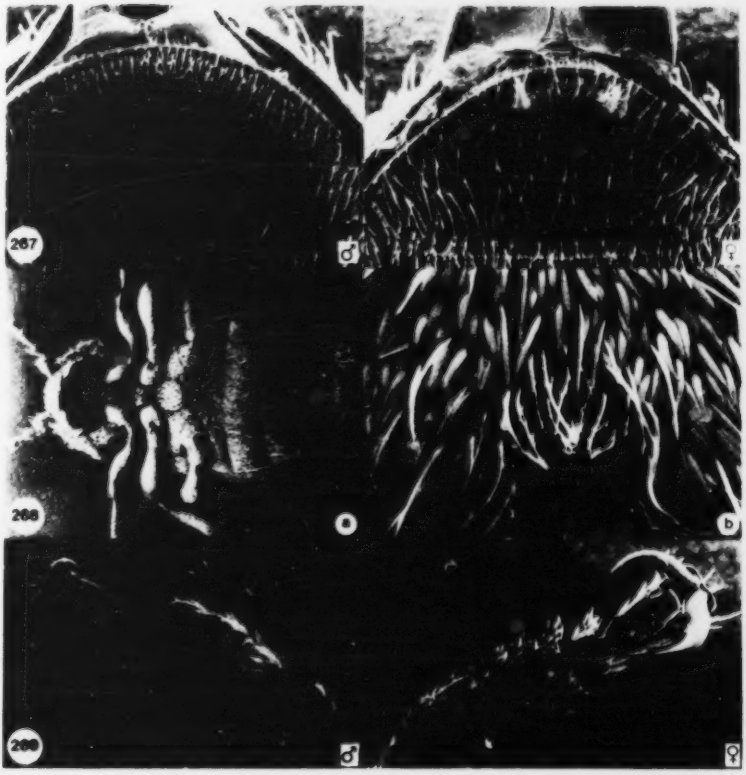


Figs. 257–259 (257) ***Alphitobius diaperinus*** **(male, female), apex of median tibia and first tarsal segment (ventral side); (258)** ***Alphitophagus bifasciatus*** **(male, female), head (dorsal view); (259)** ***Tenebrio molitor*** **(male, female), apical half of fore tibia and first tarsal segment (ventral side).**



Figs. 260–263 (260) *Tribolium castaneum* (male), fore femur (posterior side); (261) *Dermestes lardarius* (male), third and fourth visible abdominal sterna; (262) *Trogoderma granarium* (male, female), posterior extremity of abdomen (ventral view); (263) *Gnathoncus nanus* (male, female), fore tarsus.

Figs. 264–266 (264) ***Aridius nodifer*** (male, female), metathorax (ventral view); (265) ***Mycetophagus quadriguttatus*** (male, female), fore tarsus; (266) ***Gibbium aequinoctiale*** (male), (a) body (ventral view, circle indicates position of sexual tuft), (b) metathorax (ventral view).



Figs. 267–269 (267) ***Pseudeurostus hilleri*** (male, female), last visible abdominal sternum; (268) ***Trigonogenius globulus***, male, (a) body (ventral view, circle indicates position of sexual tuft), (b) part of metasternum; (269) ***Blapstinus substriatus*** (male, female), fore tarsus.

GLOSSARY

To make this guide easier to use, certain entomological terms are defined briefly below. In general, these definitions apply only to beetles; in other insect groups, some of the terms may have different meanings.

abdomen The posterior division of the insect body; it consists of a number of segments and in beetles is usually partly or entirely covered by the elytra.

abdominal sternum (pl. abdominal sterna) The ventral division of a segment of the abdomen (Fig. 271).

abdominal tergum (pl. abdominal terga) The dorsal division of a segment of the abdomen (at, Fig. 35).

antenna (pl. antennae) A pair of segmented appendages borne on each side of the head in front of the eyes (Fig. 270).

antennal cavity A groove in which the antenna is partly or entirely concealed (ac, Figs. 25 and 90).

antennal insertion The point of attachment of the antenna (ai, Fig. 112).

apex (pl. apices) The part opposite the base by which a segment or joint is attached; on the pronotum, the part nearest the head.

apical Related to the apex of a structure.

basal Related to the base of a structure.

base The part of the structure that is attached to or nearest the body; on the pronotum, the part nearest the elytra.

bead The upturned border of the pronotum (Fig. 270).

carina (pl. carinae) A longitudinal narrow ridge.

club The enlarged apical segments of an antenna (cb, Figs. 10 and 11).

clypeus The part of the head between the labrum and the frons (Fig. 270).

constricted Narrowed.

coxa (pl. coxae) The basal segment of the leg (Fig. 271).

coxal line A carina on the first visible abdominal sternum that originates below the hind coxa (cl, Figs. 83 and 102).

crenulate With small rounded teeth.

decumbent Used in reference to setae bending downward.

denticulate With small acute teeth.

disc The central area of a structure.

elytral Related to the elytra.

elytron (pl. elytra) The anterior wing of Coleoptera, which is modified into a hard structure covering the posterior wing (if present) and part or all of the abdomen (Fig. 270).

entire With the margin unnotched.

episternum The anterior lateral sclerite on each thoracic segment.

facet A lens-like unit of the compound eye.

femur (pl. femora) The third segment of the leg located between the trochanter and the tibia (Fig. 271).

fovea (pl. foveae) A pit or deep depression on the integument.

frons The upper portion of the head posterior to the clypeus (Fig. 270).

gena (pl. genae) The lateral part of the frons (Fig. 270).

granule A minute tubercle.

head The anterior part of the insect body bearing the eyes, antennae, and mouth structures.

humeral Related to the shoulder or the latero-basal angle of the elytron.

integument The surface of the insect body.

intercoxal process The area between the coxae (Fig. 271).

interval The area between two striae of the elytra (Fig. 270).

labrum The area of the head in front of the clypeus (Fig. 270).

larviform Resembling a larva (without wings and elytra) (as in Fig. 201).

lateral Related to the side.

mandibles A pair of tooth-like structures situated on each side of the mouth (md, Fig. 4).

margin The border of a structure.

maxilla (pl. maxillae) One of the paired mouth structures on the ventral part of the head.

maxillary fossa A cavity into which the maxilla is articulated (mf, Fig. 156).

maxillary palps The pair of palps attached to the maxillae (Fig. 271).

medial (or median) Referring to the middle.

mesepisternum Episternum of the mesothorax (Fig. 271).

mesosternum The medial part on the underside of the mesothorax in front of and between the median coxae (Fig. 271).

mesothorax The second of the three thoracic segments bearing the median legs and the elytra.

metasternum The medial part on the underside of the metathorax between the median and the hind coxae (Fig. 271).

metathorax The last of the three thoracic segments bearing the hind legs and the posterior wings.

metepisternum Episternum of the metathorax (Fig. 271).

microsculpture Microscopic sculpture on the integument.

neck The area connecting the head and the prothorax in beetles with a free head.

ocellus (pl. ocelli) The simple eye on the head consisting of a single bead-like lens (oc, Fig. 6).

pronotal Related to the pronotum.

pronotum The upper surface of the prothorax (Fig. 270).

prosternum The medial part on the underside of the prothorax in front of the forecoxae (Fig. 271).

prothorax The first of the three thoracic segments bearing the fore legs.

pubescence The short closely set hairs covering an area.

punctate Covered with punctures.

punctation The total punctures of an area.

puncture A minute impression of the integument.

scale A modified, flattened seta (see Figs. 93 and 94).

scutellum A more or less triangular sclerite in the middle of the base of the elytra (Fig. 270).

serrate Used in reference to an antenna in which some of the segments are wider on one side (as in Fig. 15).

seta (pl. setae) A hair-like or bristle-like outgrowth of the integument.

shoulder The humeral angle of the elytron (Fig. 270).

sinuate Having the margin curved or wavy.

spiniform In the shape of a spine.

spot A small area on the integument of different coloration than the surrounding area.

stria (pl. striae) A fine, longitudinal impressed line in the elytral integument, between two intervals, sometimes represented only by punctures (Fig. 270).

strial Related to the striae.

striated With striae.

suberect Used in reference to setae that are not completely upright.

sulcus (pl. sulci) An impressed line.

suture The median line where the elytra meet (Fig. 270).

tarsus (pl. tarsi) The last part of the leg, consisting of segments and attached to the tibia (Fig. 271).

temple (pl. tempora) The area of the head behind the eye (te, Fig. 109).

thorax The second and median division of the insect body consisting of three segments—prothorax, mesothorax, and metathorax.

tibia (pl. tibiae) The fourth segment of the leg between the femur and the tarsus (Fig. 271).

trochanter The second segment of the leg between the coxa and the femur (Fig. 271).

vestiture The structures, such as hairs and scales, covering the integument.

wing The organ of flight located under each elytron.

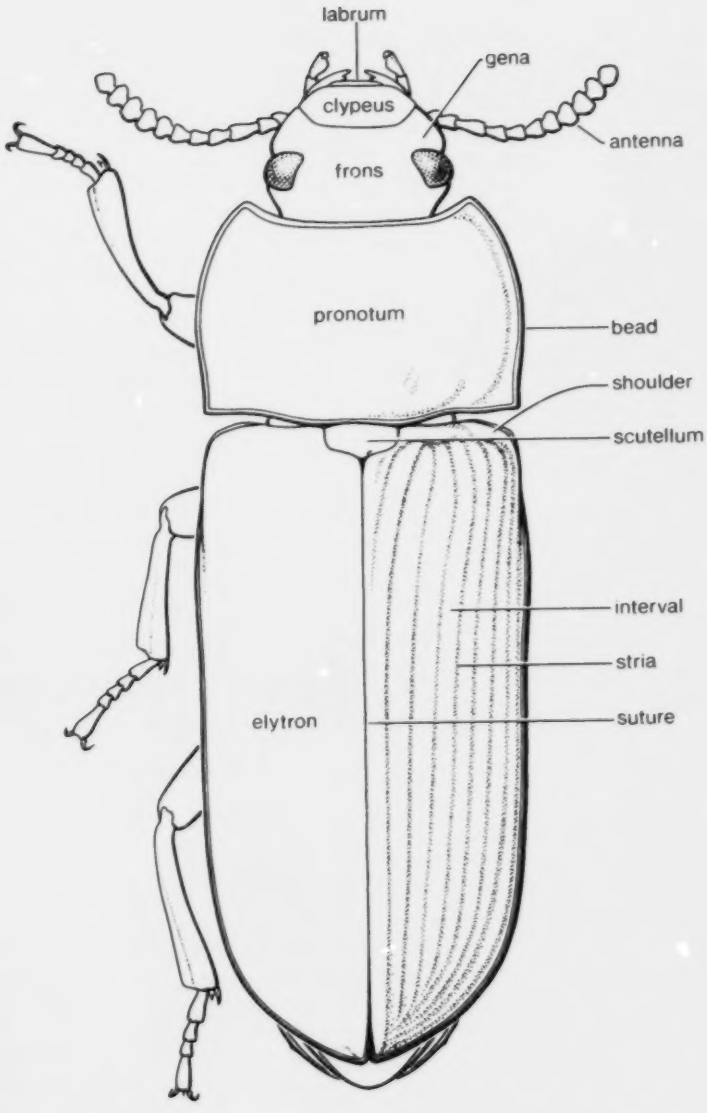


Fig. 270 ***Tenebrio molitor*** **(dorsal view).**

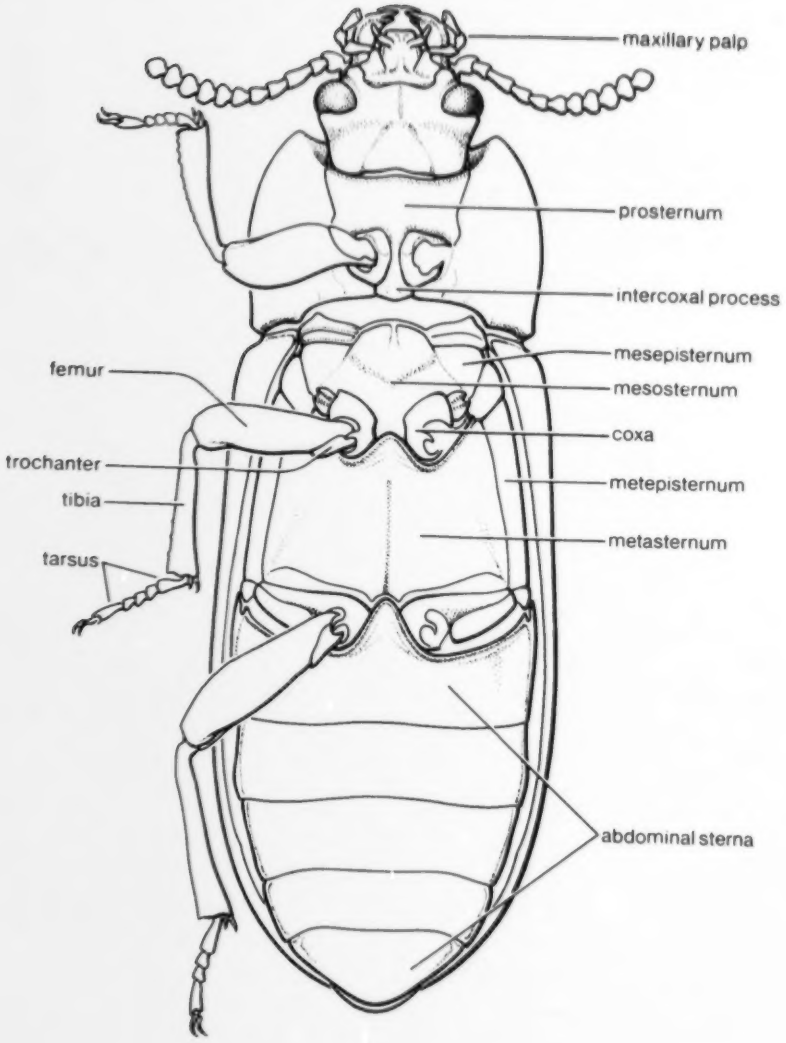


Fig. 271 ***Tenebrio molitor*** **(ventral view).**

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